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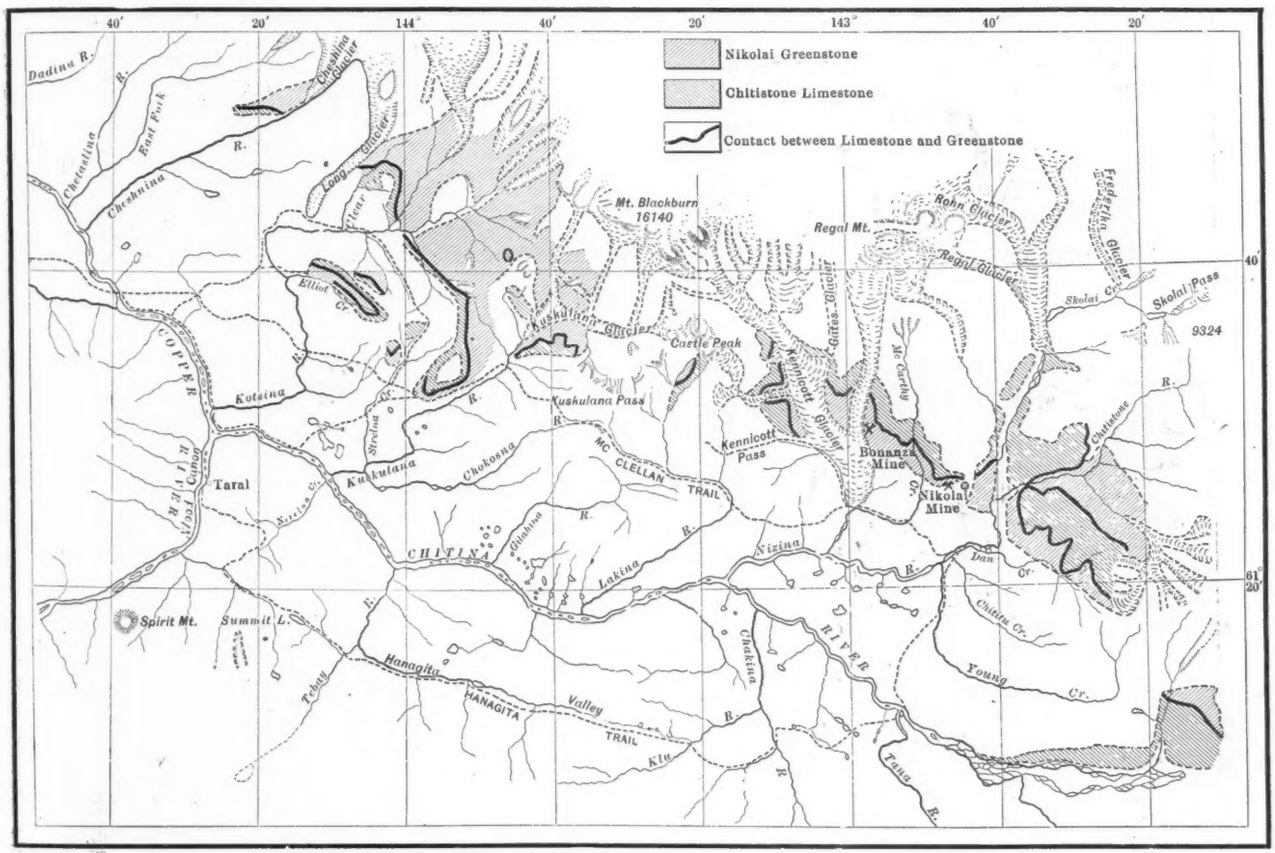
The Copper River District, Alaska

Rich Deposits of Copper Sulphide Ore Lie about 150 Miles from the Coast and Will Soon Be Reached by a Railroad

BY HERMANN A. KELLER*

Like British Columbia, Alaska is mountainous to such a degree that it has always been a great problem to find routes to tap the interior districts from the coast. Along the coast of Alaska there are only three, or possibly four, depressions or passes in the generally abrupt coast range which admit of the building of railroads from tidewater to the interior. One of the spots thus favored by nature is Prince William sound, where the mineral resources of the Copper River district await the advent of cheaper transportation.

Disregarding the fisheries in Alaskan waters, practically the only industry of the country is and could not possibly be anything but mining. A number of attempts have been made to introduce cattle ranching, and particularly agriculture, with good results locally. The short season, however, combined with other unfavorable conditions in the mountainous country, where wages are bound to be relatively high, will not permit of the competition of these products with those from the States, except for limited local consumption.



SOUTHERN COPPER AREA OF ALASKA

The Copper River district first attracted attention in 1899. As has been the case everywhere in Alaska, the first few prospectors went into the country in search of placer gold. These pioneers met with more or less success along Slate creek, and in some other localities, but the present importance of the region is due to the copper discoveries made a few years later. A railroad from the coast is now in course of construction to develop these resources. Considerable copper has been encountered not only in the interior, but also along the coast and the adjacent islands.

Means of Communication

The town of Valdez, which is located at tidewater at the head of Prince William sound, has been the distributing point for this territory from the very start. During my first visit in 1902, the place was but a small hamlet, but today it is an active little town of about 1500 inhabitants. The town is built upon the terminal moraine of Valdez glacier, and has a good harbor with wharf facilities. Six large steamers arrive monthly from Seattle, which is 1250 miles distant. The steamers make the trip in 4½ days.

There is a military cable from Seattle to Valdez, via Juneau. From Valdez this telegraph line goes into the interior

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DETAILS OF JUMBO OUTCROPS

OUTCROP ON BONANZA IN SECTIONS FROM SOUTH TO NORTH—FIRST SECTION

KENNECOTT GLACIER, LOOKING ACROSS ICE TO MOUNT BLACKBURN

CAMP AT BONANZA MINE IN 1902

to Eagle City, a distance of 450 miles. The telegraph line follows a military trail which forms the semi-monthly mail route through the Copper River country to Fairbanks, which constitutes the only all-American route to the Yukon. The trail is studded with fairly good road houses ten miles apart. All traveling over the trail is done in summer on horseback and pack trains, 20 miles being considered a good day's journey. Most supplies, however, are carried in during winter on sleds over the heavy snow. The snow generally breaks up late in March.

A VIEW OF NIKOLAI MINE ACROSS UPPER NIKOLAI CREEK

To reach the copper mines, the military trail is left at Tonsina bridge, a point 80 miles in, where a small prospector's trail leads southward. The first copper mines are reached near the mount of the Kotsina river, at a distance of 130 miles from Valdez. These are known as the Hubbard & Elliott group of mines. The copper-bearing region, known as the Copper River district, extends from this place to the Bonanza mine, forming a belt about 50 miles long and, speaking roughly, 12 miles wide. This district includes all the copper prospects along the Kotsina, Lakina and Kennicott rivers. There are many fine surface showings throughout this extensive region, but up to the present, owing to the many difficulties of transportation and climate but little actual development work has been accomplished, in addition to that already done by nature.

Supplementary to the copper deposits of the Copper River district are the low-grade copper sulphides along the coast, and on the islands of Prince William sound. At the coast are the La Touche and Ellamar mines, which have shipped ores regularly to the smelting works at Tacoma for several years. The ore showings are very extensive and in the interior are of remarkably high grade. The striking feature is the almost complete absence of oxidized ores, even in the outcrops, a condition which is probably due to the effects of glacial abrasion.

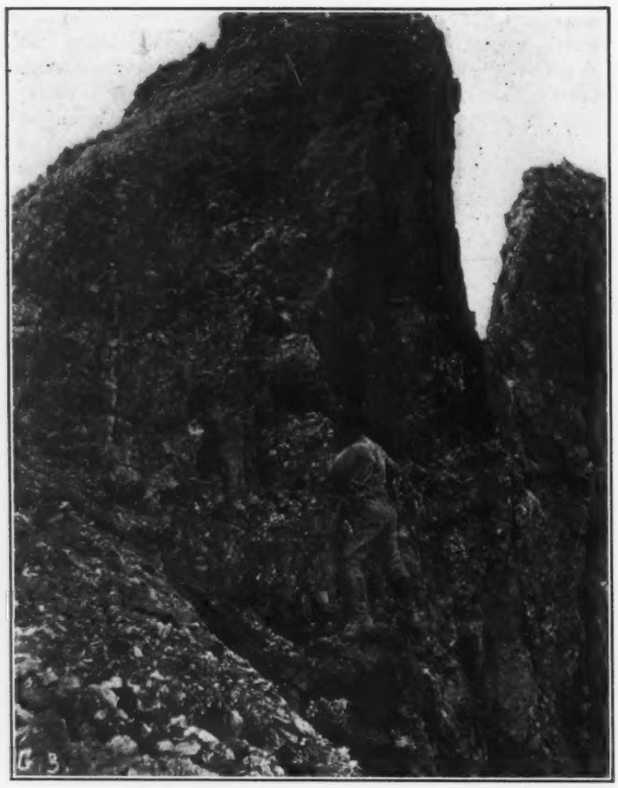
Geology

The geology of the district is very simple. The rocks are slate, greenstone, amygdaloid and limestone. Along the coast the formation consists almost entirely of greenstone and slate. At La Touche island the ore occurs in the contact between slate and greenstone. On Knight's island and Land-Locked bay it occurs in veins with indistinct walls in the greenstone, and at Ellamar in lenses in the slate. In the interior the ore occurs at the Hubbard & Elliott mines principally in the amygdaloid, directly below the Chitistone limestone, in the form of veins or replacements, showing much movement; while at the Bonanza the principal ore occurrences are found in the form of stockwork in limestone just about the amygdaloid contact.

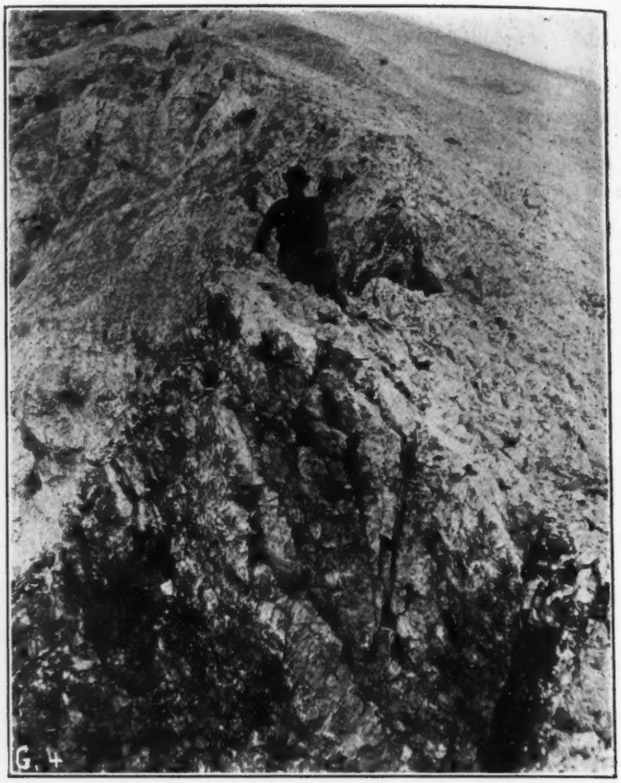
VIEW OF BONANZA MINE FROM HORSESHOE TRAIL

The low-grade silicious and iron ores along the coast should make a good smelting mixture with the high-grade silicious lime ores of the interior. Good coal mines are found along the coast near Katalla and near Seward, and will be of great importance in the reduction of the ores at some convenient coast terminal.

The principal copper minerals are chalcopyrite, chalcocite and bornite, all secondary sulphides. Native copper is frequently met with in the amygdaloid greenstone, though disseminated in small percentages. This is particularly the case in the narrow epidote veins. Along a number of the small creeks, this native copper has been concentrated as placer copper and is found in nuggets of very variable size. At Nugget creek, a nugget weighing several tons was found, and numerous copper nuggets large and small have accumulated from the gold washings along the tributaries of the Nizina river. The native copper nuggets are frequently associated with but not alloyed with native silver, an occurrence similar to that at Lake Superior. Placers will undoubtedly be found specially concentrated by nature which will pay for washing after the railway has been completed, especially when the copper in the placers is associated with gold. An analysis of a copper nugget gave the following composition: Copper 99.943 per cent.; iron 0.014 per cent.; silver 0.207 per cent.

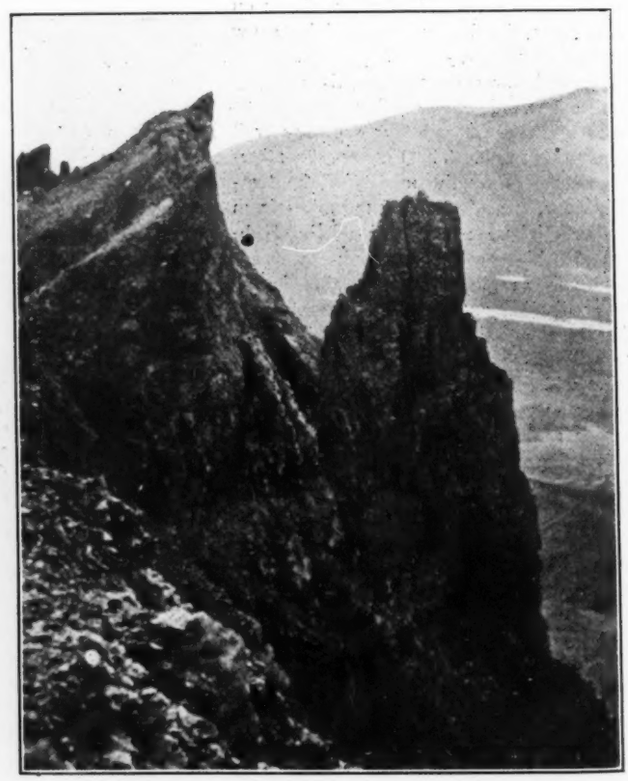


SAMPLING OUTCROP



SAMPLING OUTCROP

VIEW OF INDEPENDENCE MINE, CONTACT EAST OF BONANZA



OUTCROP SECOND SECTION

The Mines

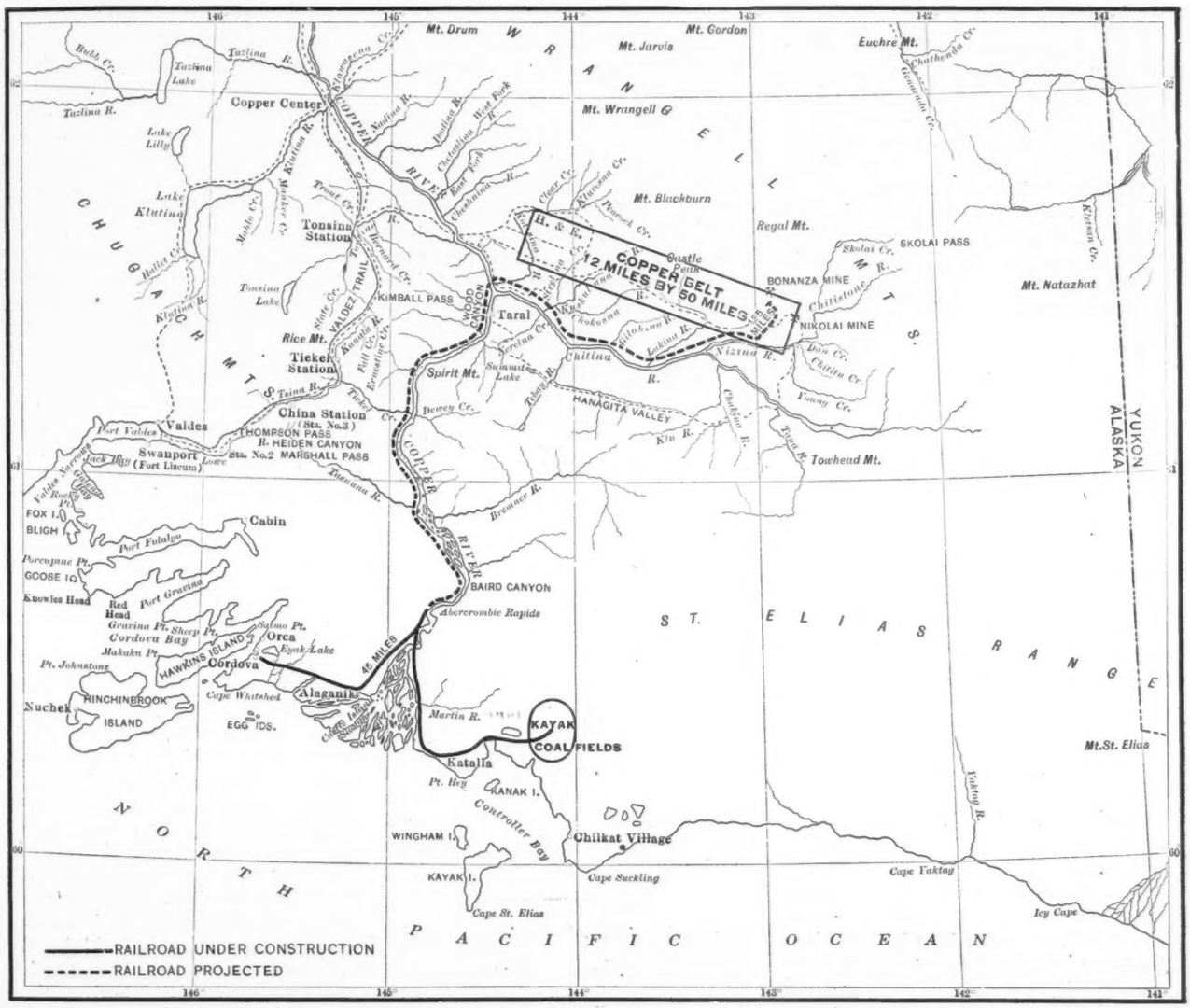
The Bonanza mines consist of an extensive group of claims located for several miles along the contact of the amygdaloid rocks with the overlying limestones. This is in close proximity to the Kenncott glacier, at a distance of about 185 miles from Valdez.

Along this line of contact in the limestone occur several large orebodies, which manifest themselves particularly by two most remarkable outcrops. These ore-

A fissure vein of lower-grade sulphides, which attains a width of 16 ft., has been traced for a considerable distance in the amygdaloid rock at the southwestern end of the property. In addition to this, there are several small quartz veins carrying native copper accompanied by epidote, which is a characteristic feature throughout the Copper River district.

Besides the mineral-bearing rocks mentioned, porphyry and granite are found in close proximity to the Bonanza mines, but

are nearly 130 miles from Valdez, the country rocks are very similar to those found at the Bonanza, but the ore formation is entirely different, and shows much movement. The ores occur almost entirely in the amygdaloid rocks, either as veins or in masses. The copper ores are mostly chalcopyrite and bornite, often replacing constituents of the country rock over large areas. The property, consisting of a large number of claims, controls the mining ground tributary to Elliott



MAP OF MOUNT WRANGELL DISTRICT, ALASKA, SHOWING POSITION OF THE COPPER BELT AND ROUTE OF THE PROPOSED RAILROAD

bodies are formed by two distinct parallel veins of chalcocite, with further mineralization of the limestone between the veins. This mineralized material consists likewise of chalcocite and oxides, in the manner of a stockwork, thus forming mineralized areas of considerable extent and of good grade. Nature has exposed and eroded these outcrops by precipitous gullies, leaving enormous quantities of broken material or wash carrying many pieces of high-grade copper ore, which can readily be hand-sorted.

have as yet shown no orebodies of importance.

The development on the property consists of short tunnels on the west side of the steep ridge, which carries the large outcrop; also of an incline following the ore to further depth from one of these tunnels. At the present time a rope tramway is in course of construction from the mine to the foot of Kennecott glacier, which is to be the terminal of the Copper River & Northwestern Railroad.

At the Hubbard & Elliott mines, which

creek. Here likewise the development consists of short tunnels, and it is proposed to build a rope tramway to connect with the railroad terminal near the mouth of the Kotsina river. The many outcrops expose copper ores of a remarkably good grade.

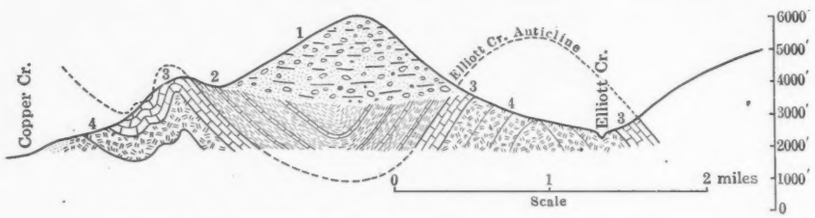
Between the mines above described are found many other well mineralized properties, but these have not been sufficiently developed to warrant a detailed description at this time.

Along tidewater, the most extensively

operated property is the Ellamar mine, 28 miles from Valdez, which has been a heavy shipper for several years. The ore-body thus far disclosed by the workings consists of a huge lense lying in the slate-country formation. The ore crops out in the bay, and the mine has been opened by a 600-ft. vertical shaft with six levels, the shaft being located very near to the west edge. The mine is now being farther developed so as to have it in good condition when the price of copper returns to a higher level.

The Big Bonanza mine on Latouche island, has also been a heavy shipper of good-grade ores for several years. The ore here occurs in a large body between a slate hanging and a graywacke foot-wall. It crops out near the seashore in the form of a large bluff, from which the ore has been quarried. It is farther opened in depth by two tunnels.

There are a large number of other promising prospects on Latouche island, as well as on the various other islands in Prince Williams sound. These await further development, and will no doubt receive attention when copper is selling at a higher price than at present.



PROFILE AND SECTION FROM COPPER CREEK TO ELLIOTT CREEK

1, Kennicott conglomerate; 2, Triassic shale and limestone; 3, Chitistone limestone; Nikolai greenstone

Coalfields

A number of coalfields are tributary to the Copper river section, and also some petroleum ground. Coal of fair quality has been found in the interior, and good lignite at Homer in Cook's inlet. The two main fields, however, are the Matanuska field, which it is proposed to tap by rail from Seward, and the extensive Kayak field, to which a branch of the Copper River Northwestern railroad is to be constructed. According to the reports of the United States Geological Survey, both these fields have an abundance of excellent coal, much of which is capable of producing first-class coke.

Climate and Transportation

The climate throughout this section is not extreme. In the interior the snowfall is naturally heavy in winter. The summer months would be delightful were it not for the swarms of mosquitoes in July, followed by equally abundant swarms of gnats and flies in August. Along the coast the snowfall is much lighter, but rains in summer are exceptionally heavy. Under these conditions the work, which is still almost all out-door work, has to be crowded into a very short season. This has made the labor conditions during the past two or three years rather difficult.

What the country needs for development above all else is a good railroad, and this is now in course of construction. The railroad is now finished for 20 miles from the town of Cordova on Prince Willian Sound into the interior, and is to be pushed this season to a point 45 miles in. This place is beyond the Copper River rapids, whence the rivers are navigable by flat-bottom steamers. One such boat has been running last season. This will in the near future open the way for shipping the high-grade ores from the interior to the railway terminal and thence to the coast.

With the exception of the section crossing the coast range, the construction of the railroad does not present much difficulty. To avoid the coast range the original shorter route from Valdez has been abandoned in favor of one directly up the Copper river. Here, to offset some of the advantages, bridges over a shifting glacier stream, strong winds, heavy snowfalls and glaciers will have to be contended with. The proximity to good coal, and the harbor facilities at the terminal, are other factors which influenced the choice of a location for the road.

The advent of the railroad should quickly stimulate development and will draw the attention of the outside world to this promising section of country.

Determination of Antimony and Arsenic in Alloys

G. M. Howard (*Journ.* Am. Chem. Soc., XXX, 378-380) describes a serviceable method for the determination of antimony and arsenic in lead antimony alloys. Tin and small amounts of iron or copper do not interfere with the method.

One-half to two grams of the fine sample are weighed into a 125-c.c. Erlenmeyer flask, 60-70 c.c. of strong hydrochloric acid added, and two or three drops (not more) of nitric acid (1:4). The flask is heated just short of boiling until solution is complete. If more nitric acid is necessary, it should be added carefully and an excess avoided. When solution is complete boil vigorously for a few minutes until the color changes from reddish yellow to colorless, or, if iron or copper is present, to straw yellow. Into the still hot solution hydrogen sulphide is passed until it is completely saturated. If insufficient hydrochloric acid has been used or the solution has been boiled too long, antimony sulphide will be precipitated as the solution cools. The hydrogen-sulphide treatment is most conveniently handled by fitting the flasks with two-hole stoppers and inlet and outlet tubes, and connecting several in series to the generator. The last flask may contain caustic-soda solution, and thus absorb the gas. When the precipitation is complete, the flow of hydrogen-sulphide gas is stopped and a current of air turned on in its place until the hydrogen-sulphide gas is expelled from the precipitating flask. The hydrogen sulphide precipitates the arsenic and reduces the other salts present that are capable of reduction, while the current of air oxidizes all except the antimonious salts.

A little tartaric acid is added to the cold solution and water until the volume is doubled; the solution is then filtered into a 16-oz. flask. Practically all of the lead chloride must be washed out of the precipitate with hot water, but after the antimonious chloride has been washed out the washings may be thrown away.

The filtrate is nearly neutralized with normal sodium carbonate and then completely with sodium bi-carbonate. The antimony is then determined by titrating with standard iodine solution, using starch solution as an indicator. One cubic centimeter of the iodine solution equals 0.005 gram antimony. If the arsenic is negligibly low the filtration may be omitted.

To determine the arsenic, the bulk of the arsenious sulphide and sulphur is washed back into the precipitating flask with not more than 20 c.c. of water, about five drops of a 20-per cent. solution of sodium hydroxide are added, the solution boiled for a few moments and then decanted into an 8-oz. Erlenmeyer flask. The treatment is repeated if necessary. The filter paper is washed with hot water and about 20 c.c. of a 3-per cent. solution of hydrogen peroxide added to the filtrate. The solution is now boiled down to about 20 c.c. and when cool about 0.1 gram of potassium iodide in solution and 20 c.c. of strong hydrochloric acid added. When cool, titrate with standard thiosulphate, adding three drops of starch solution, only when the color is almost gone. One cubic centimeter of the thiosulphate solution should be equivalent to 0.001 gram arsenic. It is well to run blanks to test the reagents, and avoid a large excess of iodide and starch. The arsenic may also be determined by the Pearce method or gravimetrically as ammonium magnesium arsenate after the above oxidation and concentration.

Costs and Profits in Silver-Lead Ore Production

Factors Governing Costs of Mining, Smelting and Marketing. Comparisons of Conditions in the Coeur d'Alene, Broken Hill and Park City

BY JAMES RALPH FINLAY*

The external factors which affect mining in the Cœur d'Alene are the most favorable of the whole Rocky mountain region. The altitude is moderate; the climate, mild; timber and water power are abundant and cheap. Transportation to consuming centers is, however, expensive, and wages are high. Labor is efficient and abundant. The mines are generally deep, measured from the surface, but the configuration of the country has permitted their attack by adit levels; so that most of the ore has not needed hoisting from great depths, and pumping operations have generally been inexpensive.

The internal factors are favorable. The veins are typical fissures. The ore is galena, which seems to be a metasomatic replacement of pre-existing veins of iron carbonate. Ransome believes that the Burke quartzite, a formation of flaggy, evenly bedded, light-colored rock about 1700 ft. thick, contains nearly all the payable ore, although veins are found traversing an immense mass of slates and quartzites of presumable Algonkian age, some over and some under the Burke quartzite. The whole sedimentary series is estimated to have a thickness of 13,000 feet.

The ore shoots are persistent and profound, with a thickness varying from 8 to 100 ft., and a length varying from 100 to 1000 ft. normal to the plunging axis. Single bodies have produced several million tons of ore. The ore in the main has to be concentrated. The proportion shipped to the smelters varies from a quarter to a tenth of the amount mined. Of the proportion shipped a considerable amount is picked out by hand either underground or at the mill, the lower grades being concentrated. In addition to the sorting of first-class ore, there is a still larger sorting of waste in the stopes. In many cases it is necessary for safety to fill the stopes, and in all cases it is economical to reject waste. The various mines differ greatly in the amount of sorting and filling done. Several of the mines have run for years without shipping any first-class ore and without sorting any waste in the stopes, everything mined being sent to the concentrator. On the other hand, one prominent mine, the Hercules, ran several years without a mill, shipping only first-class ore.

Producing Mines

The mines may conveniently be divided into two groups: the Wardner and the Cañon Creek. In Wardner there is only one vein and two important mines; the Bunker Hill & Sullivan, an independent concern, and the Last Chance, owned by the Federal Mining and Smelting Company.

The Wardner vein has been the subject of a good deal of litigation, and has been well and often described, but I will hazard a new idea concerning it: The principal object of attention has always been a great mineralized fault called the "footwall," having a strike of north 40 deg. west, and a dip of 45 deg. southwest. This fault, in my judgment, originated the lead mineralization of the district, but in an indirect way. It intersects some veins whose course is more nearly east and west, or even north 70 deg. east. These veins may originally have had only a siderite filling. The Bunker Hill fault probably reopened these veins and started the lead mineralization which replaced a large part of the original siderite. The fault movements continued in part after the lead mineralization had made considerable progress, for the lead ores have been crushed into paste along the footwall. At any rate, at and near the footwall fissure there are a number of powerful ore channels, some of which have been followed for a distance of 3000 ft. down the slope, with very little or no change in their value or character.

The mining is done almost wholly by the filling method. Whether square sets are put in first and then filled, or whether the stopes are filled without timbering depends on the firmness of the ground. This varies in different parts of the mines. In nearly all cases enough waste for the filling can be sorted out of the vein-stuff itself.

The Bunker Hill mine in 20 years up to June 1, 1907, had produced as shown in the accompanying table.

The actual expenditures differ somewhat from the figures given in the tables; I have left out of account certain items concerned with local business, such as water, electric light, boarding house, real estate, which are generally profitable to the company, but are in the nature of local mercantile transactions for the convenience of the community. Certain small purchases of mining property are, however, included in the costs under the last heading. It will be seen that these are pretty good costs, not essentially different from those of the Lake Superior region for the same kind of work as comparison with, for instance, the Copper Range, will show.

The ore shipped in 1906-7 was somewhat above the average in grade, but it will serve as an illustration of the general problem of mining on the Wardner vein. Out of 336,630 tons mined, 87,640 tons were shipped to the smelters, or one ton in 3.84. The shipping product averaged 45.83 per cent. lead and 18.78 oz. silver per ton. The ore as mined assayed 13.32 per cent. lead and 5.89 oz. silver, the milling loss being estimated at 10.43 per cent. lead and 17.06 per cent. of the silver, or 11.96 per cent. of the combined product. Without considering the high prices of the year in question, but taking average prices of $92 a ton for lead and 60c. an oz. for silver, we find that this ore is giving the following results:

PRODUCTION AND COSTS OF BUNKER HILL MINE FOR LAST 20 YEARS.

		Per ton.
Tons mined	3,388,106	
Gross value	$34,375,266	$10.15
Smelting, refining and deductions	14,249,036	4.21
Net value to mine	20,126,330	5.94
Operating costs	8,832,244	2.60
Other costs, construction, litigation, new property, exploration, etc	3,400,000	1.00
Total cost, approximately	$12,200,000	$3.60

COSTS PER TON, INCLUDING CONSTRUCTION WORK, FOR THE LAST THREE YEARS.

	1904–05	1905–06	1906–07
Tons mined	320,056	347,350	336,630
Stoping	$1.385	$1.286	$1.47
Tramming	.063	.060	.069
Shipping	.043	.049	.051
General expenses	.144	.166	.143
Exploration	.098	.19	.09
Construction	.085	.03	.044
Concentrating	.180	.185	.244
Mill construction	.03	.082	.056
Taxes, litigation, etc.	.17	.34	.253
	$2.198	$2.353	$2.620

PROFIT PER TON ON BUNKER HILL OPERATIONS.

	Lead.	Silver.	Total.
Full assay value	$12.25	$3.53	$15.78
Mill losses, say 12 per cent			1.90
Value leaving mine			13.88
Mining, milling and construction			2.39
Freight and treatment			3.71
Smelter deductions (losses to mine)			3.08
Total costs			6.20
Losses and deductions			4.98
Total costs and losses			11.18
Average profit			4.60

The Canyon Creek mines differ from the Wardner mines only in the shape of the orebodies. The dip is not far from vertical; the ore-shoots are much longer, thinner and more regular. Wages average 46c. an hour, 4c. higher than in Wardner. Details of cost are not given.

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The Federal Mining and Smelting Company for the last three years reported as follows:

OPERATIONS OF THE FEDERAL MINING AND SMELTING COMPANY FOR THE LAST THREE YEARS.

Total tons mined and milled	2,428,112
Tons lead in shipping product	166,912
Ounces silver in shipping product	10,300,049
Percentage lead	6.87
Ounces silver per ton	4.24
Value of product	$24,310,441
Smelting, refining and deductions	10,514,773
Net value to mining company	13,795,668
Profits reported	6,160,247
Total cost	7,635,421
Cost per ton, mining and milling crude ores	3.14
Cost per ton, concentrates shipped	22.03
Smelting, refining and marketing concentrates	30.35

It will be seen that these figures indicate conditions similar to those of Wardner. Further elaboration of details seems unnecessary. The costs are higher than at the Bunker Hill, but the difference at the mine is to be explained by the factors, (1) higher wages, (2) a greater amount of hoisting and pumping, (3) a charge for railroad transportation from mines to mills, (4) a greater number of power and mining plants to maintain, and a higher power cost. In each case these factors are inherent to the problem and cannot be removed.

The cost of mining and milling, of construction, of freight and treatment; and the value of the ore to the mines, free from smelter deductions for a period of five years during which the average price of lead in New York was 4.6c. and of silver 59.2c., are given for a number of properties in accompanying tables:

ESTIMATED AVERAGE VALUE OF CHIEF ITEMS.

Smelter deductions	$1.50
Loss in milling, 20 per cent. (In some of these mines where no first-class ore is shipped, the loss is probably greater; where a good deal is picked out the loss is probably less)	2.11
Gross value of ore before milling, at N. Y. quotations	10.54
Per cent. lead before milling	8.66
Ounces silver per ton " "	4.33
Cost to mine per pound lead at New York	3.54c.
Cost to mine per ounce silver at New York	46c.
Cost of lead in New York (actual cost)	3.26c.
Cost of silver in New York (actual cost)	42c.

If these mines were all owned by the American Smelting and Refining Company, and the cost of the whole process from mine to market were to be given, it would probably be something as follows:

Total value recovered per ton	$8.00
Cost of mining, milling and construction	2.90
Cost of smelting, refining and marketing	2.80
Profit per ton	2.30

The Hercules mine has the following interesting record, the tonnage being given in selected crude shipping ore and concentrates:

Tons shipped		56,446
Current mining and milling cost	$10.38	$24.02
Construction	13.64	
Freight to smelter	11.15	19.67
Treatment charges	8.52	
Total cost		43.69
Total value free of deductions		82.69
Profit per ton		39.00

This mine started without capital and created its plant out of ore. It is interesting to note how this affects the cost of mining and also to compare the costs with those of the Bunker Hill & Sullivan which went through the same process. In 20 years the Bunker Hill mined about 3,400,000 tons of ore out of which it built up its plant, paid for costly litigation involving its very life, and fought several disastrous strikes at a cost of about $1 a ton in addition to its current operating cost of $2.60.

COST AND VALUE OF ORE PER TON AT SIX MINES FOR FIVE YEARS.
(NEW YORK PRICES: LEAD, 4.6C; SILVER, 59.2C.).

	Tons.	Cost Mining and Milling.	Construction.	Total.	Freight and Treatment.	Total Cost to Mine.	Value to Mine.	Profit.
Hecla	402,000	$3.43	$0.47	$3.90	$2.56	$6.46	$9.57	$3.11
Standard	1,244,571	2.91	0.15	3.06	2.37	5.43	7.29	1.86
Tiger-Poorman	488,675	2.94	0.10	3.04	1.71	4.75	4.99	0.24
Morning	924,416	1.96	0.15	2.11	2.51	4.62	5.42	0.80
Last Chance	670,164	2.66	0.08	2.74	2.99	5.73	8.19	2.46
Total and averages	3,729,826			$2.90	$2.43	$5.33	$6.93	$1.60

If the Hercules mined one ton of concentrates to four of crude its costs were for five years:

Current operating, per ton	$2.60
Cost of plant	3.41

Doubtless when this mine shall have reached the age of the Bunker Hill its cost for construction will have diminished to about the same figure.

Cost of Smelting, Refining and Marketing

I have considered results as they are to the mining companies. It is interesting, in order to compare the results in the Cœur d'Alene with those obtained elsewhere, to see what the actual cost for smelting, refining and marketing is, and thus find how the figures would stand if the mining, milling and smelting were all done by one concern.

It appears from the reports of the largest two companies that the average ore shipped carries about 46 per cent. lead and from 18 to 28 oz. silver. Let us average the silver at 23 oz. We may assume an average price for lead in New York to be 4.60c. per lb. and silver 60c. per oz. At these rates our average ore will be worth as follows:

Lead, 920 lb., at 4.6c.	$42.32
Silver, 23 oz., at 60c.	13.80
Total	$56.12

On this, however, the smelters only pay $45.95, deducting $10.17 for losses; in addition to which they charge about $16 for freight and treatment, making a total of $26.17 per ton.

APPROXIMATE COST OF SMELTING CŒUR D'ALENE ORE.

Freight on ore to Denver at $8 per ton, allowing for 6 per cent. moisture	$8.51
Freight, bullion to New York (46 per cent. of $6.40)	2.90
Refining bullion, lighterage, etc. (46 per cent. of $8)	3.68
Losses (silver, 4 per cent; lead, 6 per cent.)	3.10
Average smelting cost, including roasting	3.75
	$21.54

Profit on this basis about $4.60 per ton.

Since however, these ores are used as a carrier for smelting many silicious ores in such a manner that the proportion of lead in the charge is reduced to only 12½ per cent., it would appear logical that in return for the service of supplying the collecting metal the lead ores should be charged for refining, etc., only in the proportion in which they appear in the smelting charge. On this basis, the charge for refining and marketing would be reduced to only $1.80 and the total cost of smelting would stand as follows:

Freight on ore	$ 8.51
Freight and refining of bullion	1.80
Losses	3.10
Smelting and roasting	3.75
Total cost per ton concentrates	$17.06

Profit on this basis about $9 per ton.

Neglecting the consideration of the last paragraph and assuming that the Cœur d'Alene ores must stand all refining charges on the metals they contain, let us apply these figures to a concrete example, that of the Bunker Hill & Sullivan Company, and deduce costs as they would be if the property were owned by the American Smelting and Refining Company:

Assay value of crude ore mined		$15.78
Mill and smelter losses		2.60
Net value recoverable		13.18
Mining cost (average of three years)	$2.39	
Smelting, refining and marketing one ton out of 3.84	4.80	
Total cost	$7.19	
Assume a charge for general expense and amortization of smelter of	0.50	7.69
Profit		$ 5.49

Costs in the Broken Hill District

For an interesting comparison let us turn from the Cœur d'Alene to the Broken Hill district in Australia where the Broken Hill Proprietary mine is by far the greatest lead-silver producer in the world. This property has produced in eight years of which reports are available to me 4,001,969 long tons of ore which yielded 398,470 long tons of lead, 35,504,331 oz. silver and 32,886 oz. gold. Reducing this to terms of short tons in order to make comparison with American mines more obvious, we have 4,482,202 short tons averaging 9.95 per cent. lead, 7.92 oz. silver and 0.008 oz. gold. The cost for mining, concentrating, smelting, refining,

marketing, general expenses and depreciation has been exactly $9 per ton.

The cost statements issued by this company look upon the whole operation as a unit, i.e., no sharp line is drawn between mining, concentrating and smelting. As nearly as I can judge, however, the costs per ton for the year 1906 were as follows:

Short tons mined, 653,362.	
Cost for mining and development	$3.01
Concentration	1.06
Smelting, refining and marketing	3.86
General expense and depreciation	.75
Total	$8.68

These costs seem to be near enough the average to give a fair conception of the general results. The figures covering depreciation are adequate. About $2,000,000 has been written off the accounts in eight years and the whole plant of this great concern stands on the books at the end of the period at only $1,933,575. There were 3,000,000 tons of ore then developed.

The costs of this mine are high owing to unfavorable external factors. The climate is extremely arid; the country is a desert. Fuel, water, labor and transportation are all expensive. As a good example let us take the fuel and flux account which amounted to $1.39 per ton, about twice as much as would be required for mining and smelting the same amount of Cœur d'Alene ore at the points where the work is done. Mine timber costs 30c. per ton mined, twice as much as at the Bunker Hill. These figures indicate such a set of external factors as to explain why it costs $4.07 per ton for mining and concentrating at the Broken Hill against $3 or less in the Cœur d'Alenes. The internal factors for mining are good.

On the smelting side we find that the proportion to be smelted is high, being one ton in 2.9, against one ton in 3.84 at the Bunker Hill. The actual cost for smelting, refining and marketing Broken Hill concentrates is $11.19 per ton smelted. This includes freight on ores from the mine at Broken Hill, N. S. W., to Port Pirie, which is $2.12 per short ton. It does not seem to include freight on bullion from Port Pirie to market. Costs mean the production of metals ready for delivery at Port Pirie. These facts seem to permit of the following comparison with American results on Cœur d'Alene.

SMELTING COSTS OF BROKEN HILL AND COEUR D'ALENE ORES.

	Broken Hill.	Cœur d' Alene.
Freight from mine to smelter, neglecting moisture	$2.12	$8.00
Freight, smelter to refinery		2.90
Smelting	9.07	3.75
Refining		3.68

It appears, therefore, that for equivalent work the American practice in smelting is cheaper than the Australian, roughly in the same proportion as the mining cost given above. We find that Broken Hill ores averaging 28.8 per cent. lead cost for actual smelting and refining $9.07 per ton against $7.43 per ton for smelting and refining Cœur d'Alene ores averaging 46 per cent. lead. The freight in American practice performs the triple function of bringing the ores nearer to bases of fuel supply, of bringing them in contact with other ores that can be profitably smelted in conjunction and of bringing them nearer the markets where they are to be finally sold.

If the freight items are to be neglected entirely the comparison is unfair to the Broken Hill work because that company, while not paying freight on its ore beyond Port Pirie, does pay freight on its fuel and other smelting supplies to Port Pirie. We are, therefore, brought to conclude that there are no figures for determining just what differences there are in smelting and refining costs between the Broken Hill and the American works. It is quite plain that mining and milling are more costly in Broken Hill than in the Cœur d'Alene and that for this the unfavorable external factors of the Australian desert are a sufficient explanation.

Taking the average cost of working the Broken Hill ores at $9 per ton and assuming that the products sell in the proportion of 3.15c.* per lb. for lead and 60c. per oz. of silver we find that Broken Hill ores are worth $11 a ton, and that lead during the period reviewed has cost 2.78c. per lb., silver 49c. per oz. and gold $18 per ounce.

Lead and Silver from Park City, Utah

In this important district there are, (1) ore-deposits in fault fissures, and (2) replacement deposits in limestone. Of the fissure veins worked thus far only one, the Ontario, has been remunerative. It seems that geologically the ores are all of fissure origin. A great flat formation of quartzite is overlaid by 200 ft. of limestone; the limestone is covered in turn by a bed of soft black shale. Faults traversing the formation produce fracturing in the quartzites and limestones, and form channels for the ready circulation of water; in the shales the fissures are entirely closed up.

The result is that the mineralization caused by waters flowing upward through fissures is stopped by the shale and compelled to seek out lateral channels in the limestone. Waters of this origin have caused the deposition of important orebodies in the limestones and quartzites. The fissuring has served to facilitate the circulation laterally fully as much as vertically. In some cases the ultimate source of the mineralization is unknown; but in other cases the flat ore-shoots in the limestone were fed from the Ontario fissure.

The Ontario mine was practically worked out many years ago. Since 1893 most of the ore has come from the limestone deposits. Of these the principal mines are the Daly-West, the Daly-Judge and the Silver King. These mines are very similar. The orebodies usually have a pitch of between 5 and 15 deg. from the horizontal, and are from 50 to 200 ft. wide, and from 3 to 30 ft. thick. They follow fissures, and hence have fairly well defined courses for considerable distances, but they frequently leave one fissure to follow another. Where the limestone is brecciated at the intersection of fissures the orebodies are largest.

The original ore was a mixture of sulphides of iron, lead, copper and zinc, carrying considerable silver and some gold. Oxidation has effected an important rearrangement. Nearest the surface the ores are lead carbonates free from zinc; lower are lead sulphides rich in silver but free from zinc; lower still there has been an important regeneration of zinc blende, and at this zone the ores are much inferior in lead and silver content. The zinc regeneration is immediately above the unaltered sulphides; these are sometimes payable, but have not been worked much.

Costs at Park City Mines

A great deal of gangue occurs in the ore and must be sorted out. At the same time much of the ore is high-grade and cannot be improved by concentration; one-third to one-half of the ore mined is of this character. Exploration and development are expensive owing to the dip and irregularity of the orebodies. These internal factors make the costs high.

The external factors are about the average for the Rocky Mountain region.

DALY-WEST PRODUCTION IN SEVEN YEARS.

	Tons.
Crude ore shipped direct	224,418
Ore milled	489,415
Total	713,833
Concentrates shipped	97,634
Total shipments	322,052
Lead, 73,942 tons, at $92	$ 6,800,000
Silver, 17,167,000 oz., at 57c	9,785,000
Gold, 13,847 oz., at $20.67	280,000
Copper, 12,164,000 lb., at 15c	1,800,000
Total value	$18,665,000
	$58 per ton.
Freight, treatment and deductions	$8,327,000 = $25.86 per ton
Cost of mining and milling	13.72 per ton.
Total cost	$39.58 per ton.
Profit per ton shipped	18.42

RESULTS PER TON MINED.

Average value, $28.40.	
Cost of mining and milling	$ 6.26
Milling losses, average 8 per cent*	2.24
Freight, smelting, refining and deductions	11.66
Total cost	$20.16
Profit per ton mined	8.24

*See explanation below.

SUMMARY OF DALY-WEST COSTS—1900 TO 1906 INCLUSIVE.

	Per Ton Mined and Milled.	Per Ton Ore and Concentrates Shipped.
General expense	$0.42	$ 0.92
Exploration and Development	0.60	1.31
Mining	3.38	7.40
(Per ton milled)	(1.36)	
Milling	1.00	2.19
Construction	0.30	0.66
Shipping and selling	0.56	1.24
	$6.26	$13.72

One may indulge a little skepticism as to the accuracy of these reported savings

*I have assumed 4.6c. per lb. as an average price for American lead. The tariff makes the difference.

in the lead. It seems that the ore must have been assayed for lead by fire assay which gives inaccurate results, or there must have been errors in sampling and weighing. I prefer to believe that the saving of lead was about the same as that reported for silver. We may lump the whole mill saving roughly at 75 per cent. On this basis the mill losses would be about 8 per cent. of the entire product.

MILL SAVING REPORTED.

	Lead, per cent.	Silver, per cent.
1900	92.	67.69
1901	92.87	70.16
1902	93.	72.
1903	97.9	72.3
1904	99.	70.5
1905	99.5	72.5
1906	98.44	73.04

The Daly-Judge mine is west of the Daly-West, and the orebodies are in the zone of zinc regeneration, or in the original sulphides underlying that zone. The mine has not been very profitable. Attempts have been made to improve the mill from time to time and the result has been a considerable cost for construction, but since the improvements do not seem to guarantee future earnings the construction should probably all be charged to operating.

SIX YEARS' OPERATION, DALY-JUDGE MINE (213,000 TONS).

Lead, 19,375 tons		$1,785,000
Silver, 1,390,000 oz		792,000
Gold, 4,800 oz		99,000
Copper, 272,000 lb		41,000
Zinc, 8,614 tons		900,000
Total value		$3,617,000
Cost of smelting, refining and marketing and smelter deductions (losses)	total	$1,845,000
	per ton	8.66
Mining and milling costs		7.27
Probable mill losses		3.00
Total costs and losses		$18.93
Profit		1.00
Total value of ore as mined		$19.93

DETAILS OF COST FOR 1907.

Mining	$3.03
Exploration aud development	0.40
Concentrating	0.95
Shipping and selling	0.33
General expense	0.53
Construction	0.21
Total	$5.45

These costs are lower than the average. During the period under review the mine was shut down for two years in order to prosecute development. Development in the whole period has averaged about $1.50 per ton.

The Silver King is a rich and profitable mine. It does not publish reports, but its costs are approximately $9.40 per ton mined and milled and $15.50 per ton of selected ore and concentrates shipped. The ore is richer than the Daly-West in lead and much richer in gold, but about the same in silver.

The Park City ores present the following factors making high costs: (1) Relatively small orebodies that must be followed over large areas, thus establishing a high cost for exploration and development; (2) a careful selection of the ores and the rejection of large amounts of waste; (3) a large percentage to be smelted and a very high charge for smelting.

Owing to the fact that losses in smelting are charged off arbitrarily, and that the real losses are unknown, it has seemed best to group the costs and losses together. It is probable that considerable profits are derived by the smelters. Let us take the Daly-West shipments as an example. These ores have averaged almost exactly 25 per cent. in lead and copper and have a gross value of $58 a ton on average prices. The average cost for smelting, refining and marketing these ores, including losses, has been $25.86 per ton. It does not seem probable that the losses in smelting and refining have exceeded 5 per cent. of the value, although in lead and copper they may have been a little more than that. Assuming 5 per cent. loss, there remains for smelting, etc., $23 a ton. Freight on bullion to New York is about (including freight on ore from mine to smelter) $16 a ton. Refining is about $7 more: $23 for freight and refining. Since only 500 lb. to the ton has to stand these costs we get $5.75 a ton on the original ore smelted. There remains about $17.25 a ton for smelting.

The American Smelting and Refining Company does not publish its costs, but the actual current cost of lead smelting is only about $2.50 per ton of charge. What must be added for amortization of plants and how the whole cost would properly relate to the ton of lead ore as distinguished from the charge, I can only conjecture; but it seems hardly probable that the total would exceed $5 a ton. This would leave $12.25 a ton profit and $10.75 actual cost, and $13.65 including losses.*

Assuming that these figures are not far from the truth, and assuming 2.2 tons mined to one ton shipped, we have for the whole problem of silver-lead ores at Park City the following minimum costs per ton mined, as shown by the experience of the last seven years:

Mining, milling and all costs to mining company	$ 6.26
Smelting, refining and marketing	5.57
Total	$11.83

Since mill losses must be estimated at not less than 10 per cent. on low-grade ores and smelting losses at 5 per cent. more, the actual costs can only be 85 per cent. of the original value. In round numbers, therefore, an ore in Park City must be worth $14 a ton before there can be a profit in it for anybody. At average prices this figures about 10 per cent. lead and 8 oz. silver.

*That these statements regarding smelting costs are not too low is proved by a contract reported by H. M. Adkinson in the JOURNAL of May 16, 1907, by which an ore containing 24 per cent. lead, 24 per cent. iron, gold 0.13 oz. and silver 12 oz. was smelted for a total charge of only $7.45 a ton for all smelting and refining charges, freight and deductions.

Gold Mining in West Africa

SPECIAL CORRESPONDENCE

The Wassau (Gold Coast) Mining Company has issued in London its report for the year ending Dec. 31, 1907. The value of the gold won was £107,640 from 50,210 tons milled, an average of 42s. 10d., or $10.28. The working costs amounted to 32s. 5d., or $7.78 per ton, but no profit was shown, the difference between revenue and working costs being charged to depreciation and development accounts. The ore reserves April 30, 1908, were estimated at 101,478 tons, of the value of 9.9 dwt. per ton. A further 10 stamps is to be added to the battery, making 40 stamps altogether. The company appears to be about paying its way and that is all.

The report of the Gold Coast Amalgamated Mines for the year ending March 31, 1908, has also been issued. This is a company that is not at present doing any work, but is interested in three producing mines, and in a number of other companies which are at present shut down. Until the best mines make a better showing than they have been able to do so far, there is little chance of money being found to start up work on those which are not so promising. It is reported, however, that further development work is to be done on a property adjoining the Wassau mine, called the Cinnamon Bippo, upon which work was done in 1904. A sum of £56,000 has been guaranteed for this purpose.

The three producing mines in which the Gold Coast Amalgamated Mines Company is interested are the Abbontiakoon Block I, the Prestea Block A and the Wassau. Reference to the Wassau is made above. Both the Abbontiakoon and the Prestea mines produce considerable quantities of gold, but the cost of getting it out leaves no profit for the shareholder who has embarked his capital. In 1907 the Abbontiakoon produced gold to the value of £122,303, while the Prestea mine produced £194,046. The latter mine appears to be the most promising investment of the Amalgamated company. An additional 10 stamps is to be added, making the battery 60 stamps in all, while more economical working costs are anticipated when railway communication with Tarkwa, on which construction work is about to be started, has been established.

On the whole gold mining on the West Coast has been a failure. The exceptions —they cannot be called brilliant exceptions—are the Abosso and Tarquah mines, and the Ashanti Goldfields Corporation. This latter company has recently issued a circular announcing promising developments at the mines and the erection of an additional plant is proposed.

Ores and Mines of Santa Eulalia, Mexico

In Spite of Low Metal Prices This District Is Fairly Active Owing to the Demand for Its Oxidized Silver-Lead Ores

BY CLAUDE T. RICE

There are several classes of ore at Santa Eulalia: those ores which contain much silver and little lead and are accompanied by a silicious gangue; those that contain much lead and a smaller amount of silver than the first class of ore, and are accompanied by a calcareous gangue; the lime ore that is simply an impregnation of the limestone by silver chloride and manganese oxide; the irony ore of the Mina Vieja; the mixed sulphides of the Potosi and the Santo Domingo; and the zinc ore of the Potosi.

The siver-lead ore is characteristic of the upper orebodies of the Western camp. They are associated with a silicious gangue which is in excess of the iron and calcium. The ore is low in lead, carrying generally only 2 to 4 per cent. of lead. The silver is in the form of silver chloride and the ore is heavily stained with iron oxide. The Santander ore is typical of this class as is also the upper ore in the Mina Vieja. The Santander ore shipped at present carries approximately 2 to 3 per cent. lead, 40 to 50 oz. silver per ton, 30 per cent. silica, 10 per cent. iron and 15 per cent. calcium oxide.

The lead-silver ores are characteristic of the Middle camp. The lead occurs generally in crystalline aggregates of cerussite, but sometimes the ore much resembles the sand carbonates of Leadville, Colo. These ores are always accompanied by a calcareous gangue, and are more or less stained with manganese and iron oxides. This oxidized ore in the Middle camp carries approximately 25 per cent. lead, 15 oz. silver per ton, 20 to 35 per cent. iron, 5 to 10 per cent. calcium oxide and 1 to 2 per cent. zinc. In the upper levels the ore is likely to carry more gypsum than calcite as a gangue.

The largest one of these bodies, which I saw, was about 700 ft. long and had a maximum width of 450 ft. and was developed throughout a vertical hight of more than 100 ft. A more typical orebody of this Middle camp had a maximum width of 75 ft. and a length of 300 to 400 ft. It was developed throughout a vertical hight of 200 feet.

The impregnated limestone occurs mainly at the Mina Vieja. This ore is a limestone carrying 10 per cent. manganese and about 40 oz. silver per ton, the silver being in the form of silver chloride. The Mina Vieja dry ore is blackish in color, the silver occurring as silver chloride. It carries approximately 100 oz. silver per ton, 1½ per cent. lead, 20 to 25 per cent. silica, 20 to 25 per cent. calcium oxide. 16 per cent. iron and no zinc.

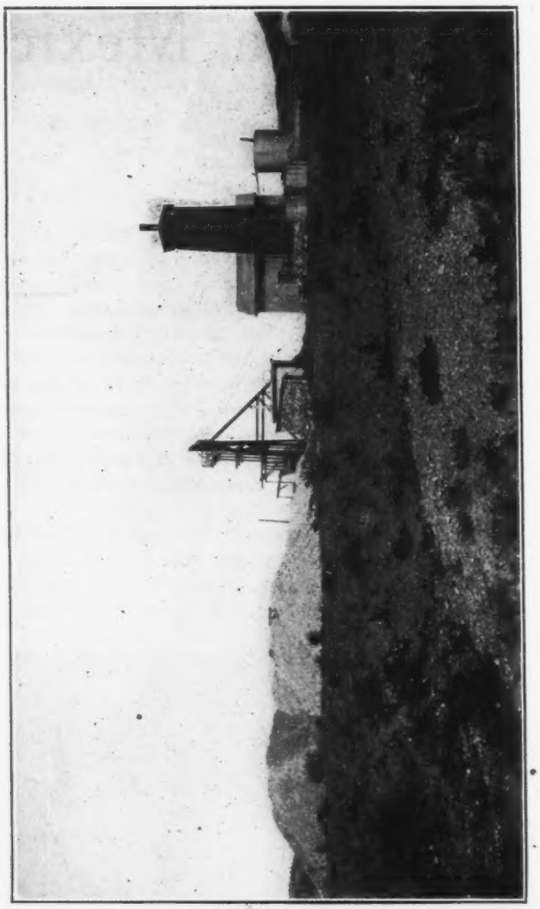
The mixed sulphides have a calcareous gangue and consist of an intimate mixture of galena, sphalerite and pyrite. They are found in the Potosi and Santo Domingo mines at a depth below surface of about 1600 ft.

The oxidized zinc ore is found in a large body in the Potosi mine, and in the Buena Tierra mine, adjoining the Potosi mine, a body of zinc ore is being developed. The zinc orebody in the Potosi mine carries 30 to 45 per cent. zinc and is quite free from lead. The zinc occurs in the ore mainly as carbonate and as silicate. Frequently the smithsonite occurs in hard translucent green and blue masses.

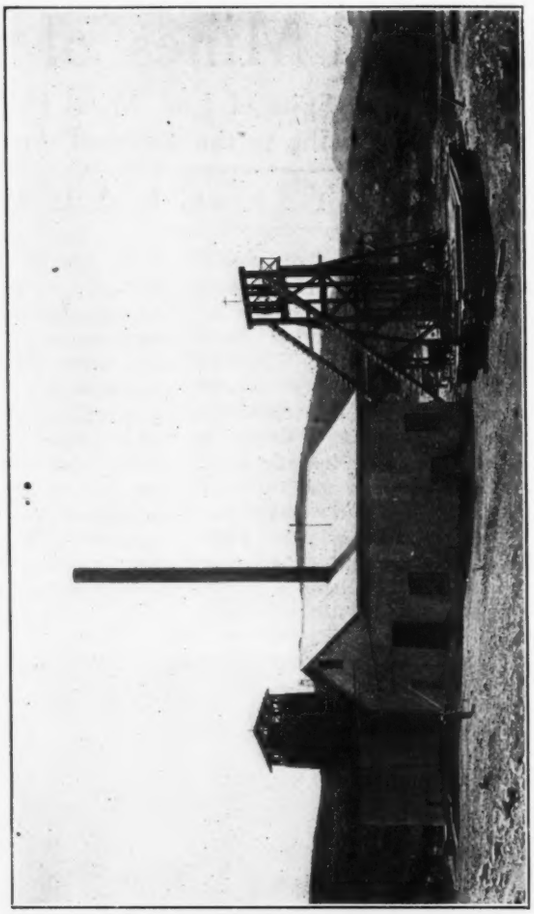
GASOLINA MINE, MIDDLE CAMP, SANTA EULALIA, MEXICO

Distribution of the Ores

The Santa Eulalia district appears to be divided into three camps, the East camp, the Middle camp, and the area on the west near the old Parcionera mine. Among the mines of the East camp are

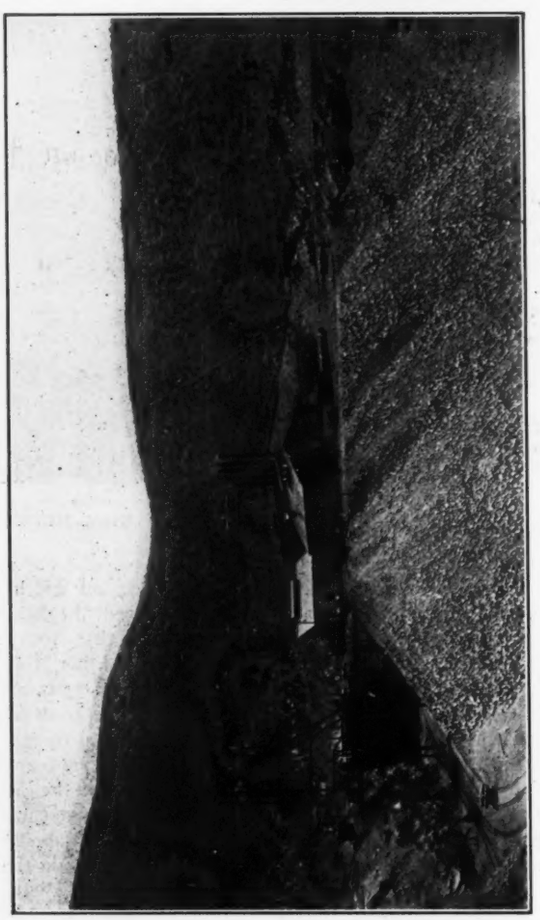


HEADFRAME AND DUMP, DEMOCRACIA MINE



DEMOCRACIA MINE, MIDDLE CAMP

JUAREZ MINE, SAN TOY MINING COMPANY



POTOSI MINE, MIDDLE CAMP

the San Antonio, Santa Juliana, Las Tres Mercedes, Josefina, and Dolores mines.

In the Middle camp the properties that at present are working are the Santo Domingo, Potosi, Buena Tierra, Gasolina, Bustillos, Galdeana, Juarez, Reina de Plata, Coronel group, Democracia, Inglaterra and San Antonio Chico mines.

In the Western camp, about a mile west of the Santo Domingo mine, there are several mines; principal among these are the Mina Vieja, Las Animas, Velardeña, Esmeralda, Santander, Santa Rita, and Parcionera, the last two of which are not working.

The East Camp

Owing to lack of transportation the East camp has not been developed as much as the other two and consequently has not produced as much ore. It is about five miles to the east of the Santo Domingo mine of the Middle camp.

Santa Juliana—This mine is producing a small amount of ore, which occurs in *mantas* and fissures. The shaft is 800 ft. deep, but the ore mined at present comes from comparatively shallow workings.

Las Tres Mercedes—This property is developed by a shaft 350 ft. deep. The ore which occurs in fissures and *mantas*, is about neutral and carries approximately 15 per cent. lead and considerable silver. The mine is making small shipments of ore periodically at present, and has produced considerable ore in the past.

San Antonio—This mine belongs to the American Smelting and Refining Company. The ore occurs along a north and south dike, and is developed by a shaft more than 1000 ft. deep; it is said that the richer ore comes from the bottom levels.

Middle Camp

Chihuahua Mining Company—This company owns the Santo Domingo mine, the Coronel group to the south of the Potosi, and the Santa Rita claim near the Parcionera mine. At present the company is working only the Santo Domingo mine and the Coronel group.

The Santo Domingo mine is the deepest in the district. The three-compartment shaft, which was sunk 700 ft. through the porphyry before it reached the limestone, is 1850 ft. deep, and from it nine levels have been driven.

The ore in the upper part of the mine is the lead carbonate ore characteristic of the Middle camp, and occurs in *mantas* extending from a vertical fissure deposit. In the deeper levels the ore changes to a mixed sulphide carrying lead, zinc and iron. The carbonate ore is somewhat enriched in depth especially near where the change to sulphide occurs, but the sulphide ore appears fairly constant in its mineral content throughout its vertical extent, indicating possibly that the sulphide orebody has undergone little enrichment. The sulphide orebody has not been developed extensively in either this mine or the neighboring Potosi, owing to the fact that the ore requires concentration before it is marketable. The development, therefore, has been confined mainly to the carbonate orebodies. About 100 men are working underground.

The Coronel group is being developed by a shaft and drifts. The mine is an *antigua*, but at present the group has no developed ore. About 20 to 25 men are working at this property.

Potosi Mining Company

The Potosi Mining Company is composed of many of the people interested in the Chihuahua Mining Company, and is under the same management. The company is working three deposits: One from No. 1 shaft, another from No. 2 shaft, and the third, called the Tunnel orebody, worked through the Potosi adit which starts near the Santo Domingo shaft.

No. 1 shaft, which has three compartments, is 1700 ft. deep, and passes through about 700 ft. of cap rock. From the shaft seven levels have been driven; the first level being the 700-ft., just under the porphyry capping, and the deepest the 1700-ft. level.

At this shaft there are two apparently separate lead deposits. The first, called the iron orebody, occurs in a whitish limestone on the second level, and has been developed for a maximum vertical hight of 125 ft. This ore ocurs as a *manta*, and has been developed for a distance of 700 ft. along its length, the face of the drift being still in ore. The ore is a more or less oxidized galena and differs entirely from the second, the carbonate orebody, which is in blue limestone; apparently there is no connection between the two.

In the carbonate orebody some of the ore much resembles the sand carbonates of Leadville, Colo., but more often the lead occurs in a crystalline aggregate of cerussite more or less stained with oxides of iron and manganese. Scattered through the ore occur pieces of chert derived from the replacement of the limestone. The carbonate ore appears to be enriched in depth, especially just before it changes to the mixed sulphide, but the sulphide ore here, as at the Santo Domingo, shows no sign of secondary enrichment.

Below the carbonate orebody there are large bodies of the mixed sulphides, which show no diminution either in size or in value in depth.

By the side of the cerussite orebody and in the same fissure is the deposit of zinc ore, containing zinc carbonate and silicate and in places zinc oxide. The ore occurs as a fissure deposit from which *mantas* extend in much the same manner as with the lead ore.

The Potosi No. 2 shaft is 1700 ft. deep, and passes through 700 ft. of cap rock. Five levels have been driven from this shaft, the deepest being the 1700-ft. Oxidized lead ore has been found on all the levels, this within the last six or seven months. The ore mined from this shaft is hoisted to the Potosi adit level, through which it is hauled to surface by mule, and delivered to the narrow-gage railroad.

The Tunnel orebody has been developed throughout a vertical hight of 425 ft. The ore, which is connected with old workings near the surface, occurs as a fissure deposit or "abra" from which several *mantas* extend. The ore is carbonate, typical of the Middle camp.

The Potosi company is working about 200 men underground.

Buena Tierra—This mine, which belongs to the Santa Eulalia Exploration Company, is situated near the Santo Domingo and the Gasolina mines. The ore is a lead carbonate heavily stained with manganese occurring in a fissure deposit from which *mantas* extend. In the mine a body of zinc ore also occurs but as yet none of this has been shipped. The shaft is 1400 ft. deep and levels have been driven at 500 ft., 850 ft., 1000 ft., 1150 ft., 1300 ft. and 1400 feet.

Gasolina—This mine belongs to the American Smelting and Refining Company. The mine is working on the same fissure orebody as the Santo Domingo. The shaft is 1400 ft. deep.

The San Toy Mining Company

The new San Toy Mining Company is working three properties, the Galdeana, Bustillos and Juarez La Central.

The Galdeana and Bustillos properties are both worked through the Galdeana shaft, which is 1100 ft. deep. The company is doing much prospecting and is mining ore on the 500-ft. level, which shows a fairly wide orebody of shipping grade. From this level a winze is being sunk on an ore-bearing fissure. At a depth of 750 ft. a drift is being driven to intersect this winze. All the ground below the 500-ft. level is practically virgin. In the upper part, the Galdeana and Bustillos were worked extensively years ago, and along these old workings occur caves lined with beautiful deposits of gypsum and some ore is still being mined by the company in these upper workings. These old workings will furnish considerable ore, but most of the ore from this mine will come from the new developments.

The Juarez deposit is opened by a shaft 430 ft. deep, but this shaft is being sunk deeper. At 360 ft. in depth, a level has been driven; considerable ore was mined by the former owner from this level, but upon striking a dike in the orebody, he stopped mining in that direction and began to follow the ore-bearing fissure in the other direction. The San Toy company, upon breaking through the dike, found an extensive body of ore on the other side.

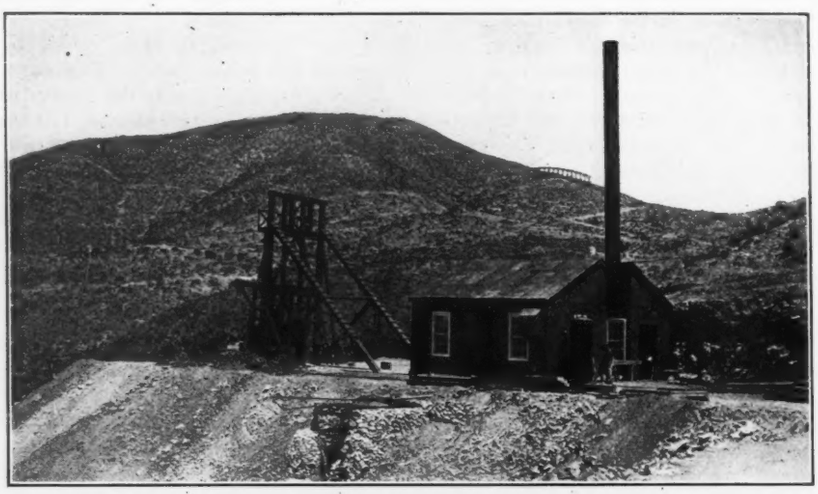
The ore in the Juarez carries about 5 per cent. lead, 35 oz. silver, 18 per cent. silica, 19 per cent. iron, 12 per cent. cal-

cium oxide, 2 per cent. manganese and 2 per cent. sulphur with no zinc.

At the Juarez the ore occurs in fissures having a strike of north 20 deg. west. The fissure has been developed for a distance of 600 ft. along its strike, and has a maximum width of about 70 ft. Several *mantas* put off from the fissure deposit. A short time ago an opening was struck going below the level, and this has been followed down about 50 ft., good ore being found in it.

The Juarez property is especially promising because of the fact that many of the important fissures of the camp pass through the property and appear to intersect in La Central.

The San Toy company is working about 200 men on two shifts. The ore is taken by a Leschen automatic tramway to the angle-station at the Galdeana, where the ore is transferred to a Trenton Iron Works tramway, which takes the ore to the bins on the spur from the Mexican Central railroad, belonging to the company.



INGLATERRA MINE, SANTA EULALIA

Other Mines of the Middle Field

San Antonio Chico—This property is developed by a shaft 600 ft. deep, only the top 70 ft. being in porphyry. On the level driven from the bottom of the shaft a cave partially filled with ore was found within 8 or 9 ft. of a porphyry dike, 2 or 3 ft. wide, which cuts through the limestone. The orebody which is inclined to be silicious carries a good deal of cerussite near the wall next to the dike.

Democracia and Inglaterra—The Democracia and Inglaterra mines which are south and east from the Potosi mine, are being developed under the same management. Both mines are very interesting as recently some ore has been found at both shafts. These properties are in the prospecting stage and appear promising. The Democracia shaft is about 800 ft. deep, the first 528 ft. being in porphyry. In the upper level a small *abra* containing ore was found, but this was not prospected much. At 672 ft. the shaft passed through a northeast-southwest dike dipping 58 deg. to southeast. Under this dike the limestone is soft and heavily stained with iron and manganese oxides, so that it looks promising; the shaft is being sunk deeper.

The Inglaterra shaft is 470 ft. deep and is being sunk deeper; the first 322 ft. is in porphyry. At 445 ft. a level is being driven to prospect a stratum of limestone in which some bunches of ore have been found. This limestone underlies a layer of clayey decomposed limestone, and is highly stained with manganese and iron oxide. In the decomposed limestone some bunches of ore have also been found; the ground looks promising.

GENERAL VIEW OF INGLATERRA MINE

The Western Camp

The ores in the Western camp are, at least near the surface, silicious, generally having 10 to 15 per cent. excess silica; but in depth the ore in the Mina Vieja has become neutral. These ores are generally also quite low in lead.

The Mina Vieja, which is considered the largest and best mine of the Western camp, belongs to the American Smelting and Refining Company. In this mine the upper orebody occurred in a fissure and the ore was rather silicious; from the fissure *mantas* extended, but at the 750 level the orebody was cut off by a dike. Below the dike a lower orebody has been found. This is a large chimney, 75 ft. wide and 570 ft. long. On the south end, the first 250 ft. or so of the orebody consists of limestone highly impregnated with manganese oxide and carrying 40 oz. of silver per ton in the form of horn-silver. This pipe is vertical and along its sides extends the layer of impregnated limestone, the thickness of which is unknown. The rest of the ore is the dry neutral ore which has already been described as the Mina Vieja ore. The Mina Vieja ore is fairly rich, carrying about 100 oz. of silver per ton. The shaft is 1100 ft. deep.

Santander—This property is developed by a shaft 600 ft. deep. Ore was struck on the 70-ft. level in a fissure at the contact between the porphyry and the limestone. The ore occurs in a vertical fissure, running nearly north and south, and forms no *mantas*. The orebody has been developed to a depth of 400 ft.; the ore is silicious as is characteristic of the upper workings of the Western camp, the silver occurring mainly as a chloride. About 30 men are working at the Santander.

Santa Rita—The Santa Rita claim is not working at present. The ore is silicious and occurs in a fissure from which *mantas* extend. The claim has produced considerable ore and there is still some ore developed in the mine.

At the Alaska Mexican mine in 1907, one pound of chrome steel in the shoes crushed 2.99 lb. ore and one pound of cast iron in the dies crushed 5.88 tons at a total cost of $0.0252 per ton for both iron and steel.

Mining Coal in Big Stone Gap Field, Kentucky

Rotary Dumps and Coke Drawing Machines Are Successfully Used. The Coke Ovens Carry a Flue Which Connects with the Boilers

BY JOHN P. SHIPPEN

The Keokee Coal and Coke Company is located in the Big Stone Gap coalfield on the Kentucky and Virginia boundary line. The property comprises approximately 8000 acres of land situated on Black and Little Black mountains and lying about five miles east of the town of Big Stone Gap. The tract is penetrated by Crab Orchard creek, a tributary of the North Fork of Powell river along which the recently completed Black Mountain railroad affords excellent transportation facilities in connection with the Louisville & Nashville, Virginia & Southwestern, and the Southern railroads.

The crest line of Black mountain attains an altitude of 4000 ft. or more on the property. It is fully 2000 ft. from the bed of Crab Orchard creek to the summit of Black mountain and in this interval there are exposed probably over 30 seams of coal. Of these beds, a dozen are over 2 ft. in thickness and five of these occur above water level and are considered of workable thickness at the present time, while several other thick seams occur below drainage. The condensed geologic section shows the principal seams occurring on the property.

Composition of the Coal

The following analyses, with the exception of the Low Splint, are taken from the preliminary report of the operation of the fuel-testing plant of the United States Geological Survey at St. Louis, Mo., 1905, under the head of the Interstate Investment Company, and the samples taken by M. J. Shober Burrows, of the Federal Survey. The coal is hard and weathers exceptionally well. Some coal mined at the same time as a sample for the Columbian Exposition and subject for 13 years to the elements, was found to analyze 1 per cent. higher in ash than a sample taken from the face:

Analysis of the High Splint Seam
Kentucky No. 5.
(Mine-run, 25 ft. from Outcrop.)

Moisture	4.32	per cent.
Volatile	36.04	" "
Fixed carbon	57.36	" "
Proximate { Ash	2.28	" "
Proximate { Sulphur	.48	" "

Analysis of the Low Splint Seam.

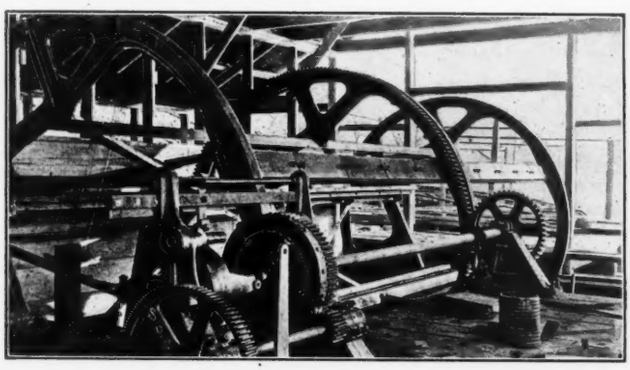
Moisture	2.80	per cent.
Volatile matter	38.15	" "
Fixed carbon	53.04	" "
Ash	6.15	" "
Sulphur	0.79	" "
Phosphorus	0.004	" "

This coal is hard and should stand up well in transportation. Its excellent character makes it adapted for steam, domestic and gas purposes.

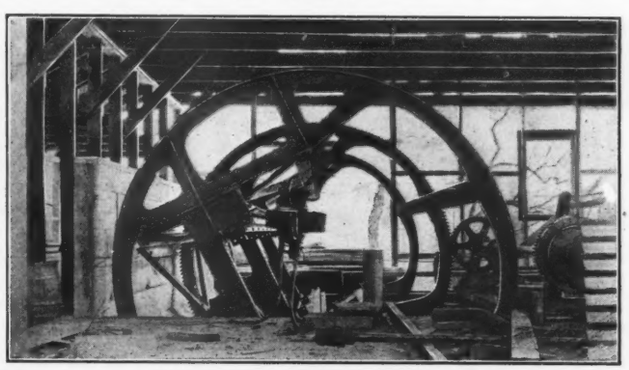
Analysis of the McConnell Seam.
(Mine-run 75 ft. from Outcrop in McConnell Mine—Virginia No. 2.)

	Coal.	Coke.
Moisture	3.86 per cent.	0.69 per cent.
Volatile matter	34.13 " "	0.93 " "
Fixed carbon	56.39 " "	90.33 " "
Ash	5.62 " "	8.05 " "
Sulphur	0.79 " "	0.65 " "

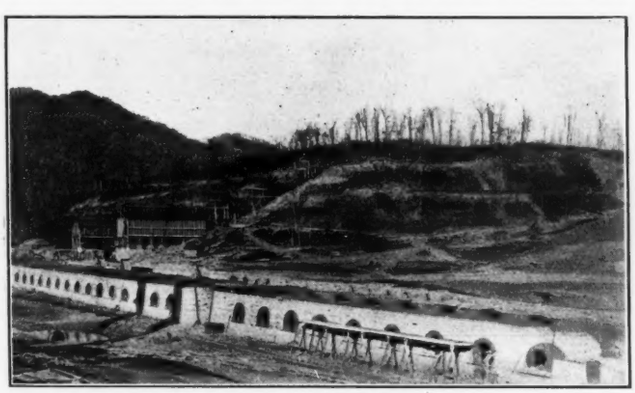
"Forty-eight hours; light gray and silvery—good heavy coke."



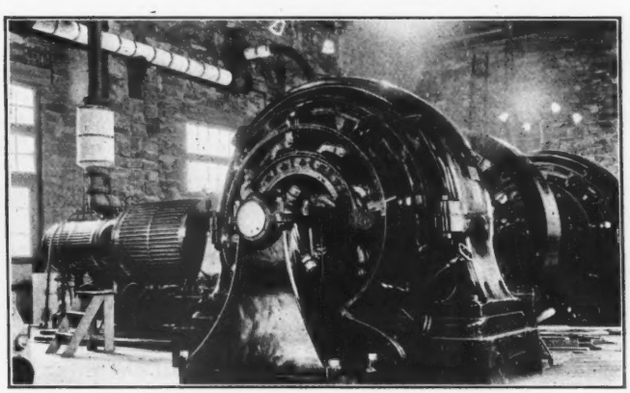
THE ROTARY DUMPS ARE THE MOST UNIQUE FEATURES OF THE OPERATION



FRONT VIEW OF ROTARY DUMP



GENERAL VIEW OF OVENS AND TIPPLE BEFORE COMPLETION



THE POWER HOUSE IS BUILT OF SANDSTONE AND IS WELL EQUIPPED

Analysis of the Wilson Seam
(Mine-run, 29 ft. from Outcrop in Wilson Mine—Virginia No. 1.)

	Coal.	Coke.
Moisture	5.70 per cent.	1.52 per cent
Volatile matter	32.52 " "	0.99 " "
Fixed carbon	56.15 " "	89.20 " "
Ash	5.63 " "	8.29 " "
Sulphur	0.98 " "	0.88 " "

"Seventy-one hours; light gray—hard heavy coke."

The accompanying table contains representative analyses of the Pennsylvania gas, coal and standard 48-hour Connellsville coke. These analyses were taken from the report of the coal-testing laboratory

of the United States Geological Survey at the World's Fair, St. Louis, Missouri.

The Ellsworth sample was taken from No. 1 colliery of the Ellsworth Coal and Coke Company, now owned by the Lackawanna Steel Company. This operation is situated in the famous gas-coal zone of the Pittsburg seam. A remarkable similarity will be seen between the Ellsworth analysis and that of the Keokee seams. The Keokee coke analysis made from the McConnell seam equals the analysis which is representative of the Connellsville product. Comparing the two, it will be seen that the contents of each bear a marked similarity, the most noticeable difference existing between the ash contents which is somewhat lower in Keokee coke. The McConnell bed has a slate top and floor of unusual soundness. The Wilson seam has a sandstone top which also requires very little timbering.

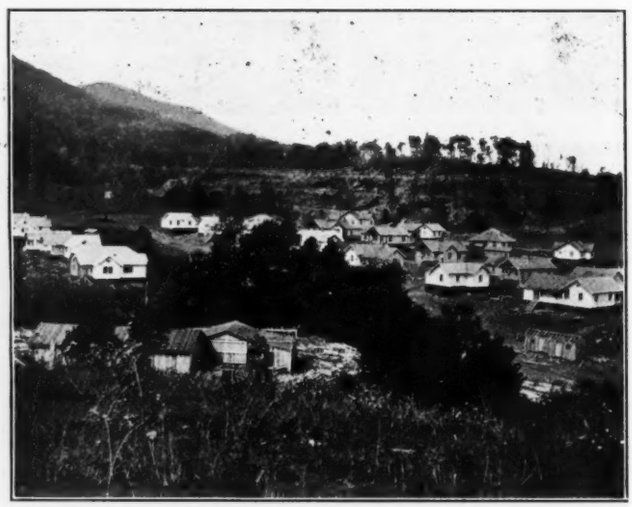
COMPARATIVE ANALYSIS OF CONNELLSVILLE AND KEOKEE COKE.

	Keokee Coke, 48 hr. McConnell Seam.	Connellsville, 48 hr. Pittsburg Seam.
Moisture	.69 per cent.	.19 per cent.
Volatile matter	.93 " "	.51 " "
Fixed carbon	90.33 " "	89.60 " "
Ash	8.05 " "	9.70 " "
Sulphur	.65 " "	.63 " "

At present, the company has opened up only the McConnell and the Wilson seams. The problem was to bring the McConnell coal and the Wilson product to a common tipple in order to ship the lump as domestic coal or graded coal from either mine, or to make coke from any combination of the two coals or from the two coals separately to suit the consumer. The Wilson and McConnell mines both go to the dip at a maximum 3-per cent. grade. From the McConnell mine the tram-road leading to the tipple comes down on a 3-per cent. grade for a little more than one-half mile and the Wilson comes up on a 3-per cent. grade about 500 yd. in length. Here the two trips go through separate rotary dumps which empty two cars each at a revolution; the McConnell trip continues in a loop around the hill to the main track while the Wilson switches back into the mine. After the coal is dumped from the rotary dumps, the coal is distributed on conveyers by reciprocating feeders. The conveyers carry the McConnell and Wilson coal over screen bars where the screenings can be taken into the crushers and mixed together, and the lump dumped separately into cars or else the whole run-of-mine can be turned through a Cornish roll crusher or breaker and from thence conveyed into two No. 5 Williams mills. The crushed coal is then elevated into a bin and distributed by an automatic tripper. The conveyers are run by one 20-h.p. and one 30-h.p. motor; the Williams crushers by two 160-h.p. motors and the Cornish breaker by a 50-h.p. motor. The larry bin has a capacity of 1400 tons and is equipped with 16 larry chutes fitted with standard roller gates operated either by hand or by compressed air. Scales have been introduced to weigh the charge going into the ovens.

DRAWING AND LOADING COKE MECHANICALLY AT THE KEOKEE OVENS

THE MCCONNELL AND WILSON MINES USING BUT ONE TIPPLE



THE MINERS' HOUSES ARE SUPPLIED WITH MODERN IMPROVEMENTS

COMPARATIVE ANALYSES OF PITTSBURG AND KEOKEE COAL.

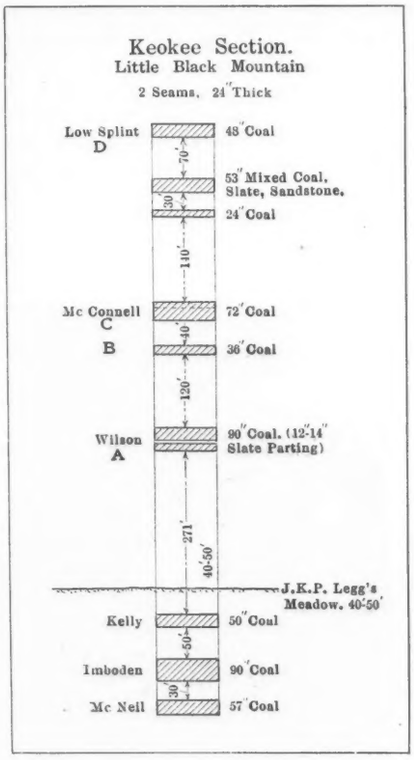
	Ellsworth Sample.	Keokee Low Splint.	Keokee McConnell.
Moisture	1.22 per cent.	2.80 per cent.	3.86 per cent.
Volatile matter	36.28 " "	38.15 " "	34.13 " "
Fixed carbon	56.24 " "	53.04 " "	56.39 " "
Ash	6.26 " "	6.15 " "	5.62 " "
Sulphur	0.84 " "	0.79 " "	0.79 " "

The tipple is covered throughout with corrugated iron and fitted with fire doors. It has a capacity of 5000 tons per day of 10 hours.

Coke Ovens

The coke-oven equipment when complete will consist of 400 ovens in three parallel batteries, two batteries of 157 and 158 respectively and a row of bank ovens 85 in number. They are all designed for mechanical operation and feed from overhead trolley larries. The coke is extracted from the ovens by means of Covington coke-drawing machines. The bank ovens are constructed along a hill beneath the power house and carry a flue on the inner side which connects in the center of the battery with the boilers, being introduced behind the fire-box.

The flue consists of a series of segments 75 ft. in length, the diameters of which increase in the direction of the boiler house. The sections are connected by expansion joints over which are laid two rows of silica brick. The ovens are connected with the main gas flue individually by means of small flues equipped with dampers to regulate the heat. Water-cooled dampers are placed near the boilers, making it possible to shut off the supply of heat to any one boiler. The gas from the oven flue travels under the boilers and enters the fire-box through the bridgewall. This method of introducing the gas makes it possible to fire with coal at any time and insure against the deleterious effect of the gas upon the grate bars. The flues are constructed of silica; fire and red brick comprising the inner, middle, and outside portions of the flue in the order given. The boilers are situated half way between the ends of the battery of ovens, the gas traveling to them in opposite directions from each half of the battery. From the upper end of the battery the flue is constructed so as to be on a level grade, while from the lower end the grade up to the boilers is about 1¼ per cent. This arrangement does away with the necessity of putting the light gases down an incline.



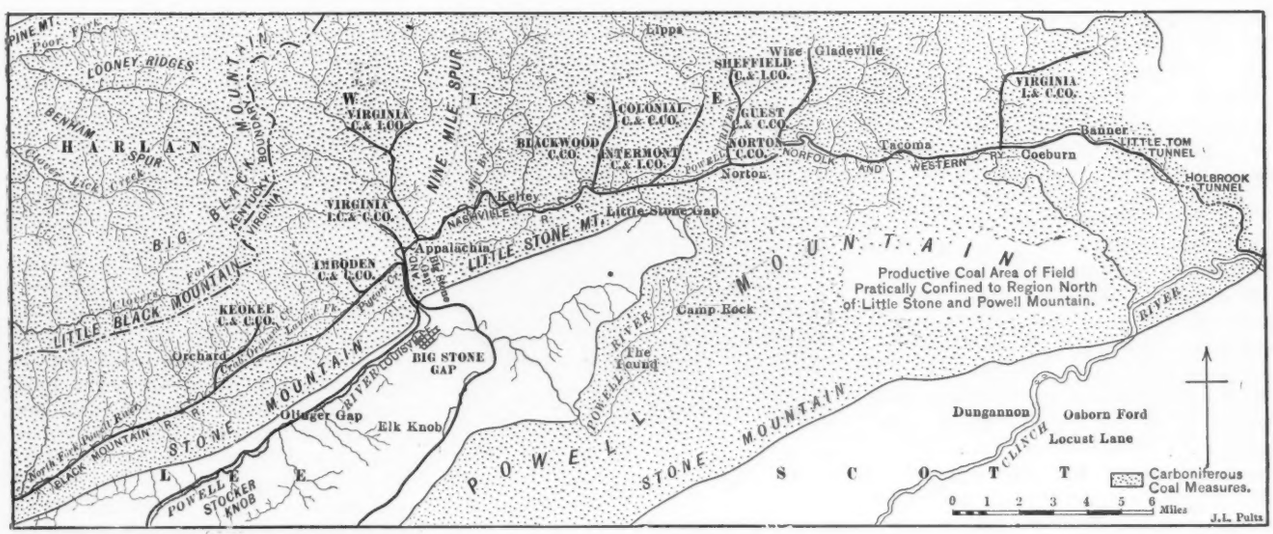
CONDENSED GEOLOGIC SECTION IN BIG STONE GAP FIELD

The Two Rotary Dumps

A unique feature of the equipment of this operation are the two rotary dumps which permit two cars of coal to be dumped without necessitating the uncoupling and breaking of the trip. The dumps revolve at the rate of 6 r.p.m. They are constructed of three cast-iron rings tied by longitudinal angle bars, and revolve on six 16-in. diameter single flange cast-steel wheels. The cars are held firmly in the dumps by side guides secured to the framework. The dumps are operated by motors of 10 h.p. each to which the dumps are geared by three spur-gear reductions, two sets being cut, the waste gear in the third reduction being a segmental gear secured to the center ring of the dump. The dump is controlled by means of a friction clutch fitted on the master gear of the second reduction.

Methods of Mining

The mines have been opened by drifts. The method of mining employed is the room-and-pillar system. Three parallel main headings are driven to the dip of the coal and a 50-ft. pillar of coal is left between them. At regular intervals, cross-headings are driven in opposite directions at right angles to the main headings. Rooms with 50-ft. centers are turned on the up-dip sides of the cross-headings and the necks are driven about 12 ft. in width for a distance of about 12 ft. before being increased to the full width of the room. The roof holds well and only a comparatively small amount of timbering is necessary. Electric mining machines are used throughout the workings. They are manufactured by the Goodman Manufacturing Company and are capable of making an undercut 6 ft. in length and 44 in. in width.



GENERAL MAP OF BIG STONE GAP COALFIELD IN KENTUCKY

Ventilation and Drainage

The split-current system of ventilation is in use in these mines. In the Wilson and McConnell mines, the air circulation is produced by two Stevens exhaust fans. The fan at the Wilson mine is 10 ft. in diameter and is driven by an 85-h.p. motor. This fan is capable of supplying 150,000 cu.ft. of air per min. The ventilator located at the McConnell mine is 7½ ft. wide and is operated by a 60-h.p. motor. Its capacity with a 2 in. water-gage read-

ing is 100,000 cu.ft. of air per min. No great difficulty has been encountered in the drainage of these mines and what water accumulates at the extremities of the drifts is expelled by means of electric pumps.

Haulage

Underground as well as outside haulage is accomplished by electric locomotives, and mules are not used in the mines. Three 8-ton Goodman locomotives are operated on the main haulage roads and one 12-ton electric locomotive of the same make handles the trips on the outside haul from the pit mouth to the tipple. The loaded cars of coal are hauled from the rooms to the headings by means of 3½-ton Goodman gathering locomotives. A special feature of the haulage equipment of these mines are the steel mine cars which were constructed by the Watt Manufacturing Company, of Barnesville, Ohio. These cars are steel throughout and are equipped with swivel couplings and flanges that insure their being held firmly in the rotary dump. The coke larries have a capacity of 225 bushels and were manufactured by the Scottdale Foundry & Machine Company at Scottdale, Pennsylvania. The mines are connected with the Black Mountain railroad by a spur about ¾ of a mile in length upon which the company operates a 60-ton Baldwin locomotive. In the main and cross-headings 45-lb. and 25-lb. rails are laid, while 25-lb. wooden rails are used in the rooms. On the outside haul, 60-lb. rails are used. The yard tracks are laid with 75 lb., the larry roads with 35-lb. and the coke-extractor tracks with 60-lb. steel.

Power Plant

The power house is substantially constructed of sandstone and has a composition roof. The power equipment consists of four 300-h.p. vertical boilers of the Wickes type, and two McEwen tandem-compound engines of 475 h.p. each direct-connected with two Goodman generators of 300 kw. each supplying a current of 250 volts, and one Ingersoll-Rand air compressor. The boilers are fed by two Smith-Vaile pumps, the feed-water going through a Berryman heater.

Houses

The situation of the company in a broad valley between the Little Black mountain and the Stone mountain has left a large acreage for the employees' houses, and an effort has been made to make these comfortable and sanitary. They are mostly of the three-room type. The design is varied and they are painted uniformly white with green trimmings. A plot 90x150 ft. goes with each house, together with a shed for a cow and a closet for coal and such supplies.

Markets

The market for the coke produced at the Keokee plant embraces a considerable area. About one-half of the furnace-coke product of the Big Stone Gap field is tributary to Chicago furnaces and the rest is consumed in Virginia, Kentucky and Minnesota. Foundry coke attains a wider range, and a considerable quantity has been shipped as far as Arizona and California. Both grades compare favorably with the Connellsville product.

Owing to the excellent quality of the coal in the Big Stone Gap region and its

SHOWING HIGHT OF COAL AND EXCELLENT ROOF

adaptability to coking, the field as a whole, has been made essentially a coke producer. There is a large coal trade in the Carolinas and Georgia and the manufacturing industry in these States is growing rapidly. Although the market for this coal is perhaps more limited than that for coke, its excellent quality, together with favorable freight rates, makes it an active competitor over an area of considerable extent. The Keokee plant has only recently been completed. It was designed and constructed under the supervision of Mr. C. P. Perin, of New York.

There are four commercial grades of dynamite which contain 40, 50, 60 and 75 per cent., respectively, of nitroglycerin.

The Bolivian Tin Industry in 1907

The chief tax commisioner of Bolivia, in a recent communication to the minister of finance, has reported the condition of the tin-mining industry of that country for the last two years. The industry is of national importance, not only as giving employment to numerous workmen and rich financial returns to its investors, but as yielding a very considerable revenue to the State in mineral patents and in taxes on the exported products.

In 1907 Bolivia exported 27,677,781 kg. of barrilla, containing an average of 60 per cent. metallic tin, equivalent thus to 16,606,669 kg. of metal. This output was contributed by various departments, in the following amounts: Potosi, 16,314,664 kg.; Oruro, 9,476,288 kg.; la Paz, 1,810,737 kg.; Cochabamba, 76,092 kg. of barrilla. The output from Potosi includes that from the districts of Uyuni, Tupiza, Colquechaca, and a part of that exported through Oruro.

Exports are taxed on the basis of the London price, and yielded an income of 1,403,571 bolivars to the treasury. The output of 1907 had a commercial value of 29,892,003 bolivars. The output of 1906 was 29,373,538 kg. of *barrilla* valued at 35,248,246 bolivars, showing a decrease of 5.7 per cent. in 1907.

The department of Cochabamba made its first production, amounting to about 37 tons in 1906, and in 1907 more than doubled its first year's output. Oruro, on the other hand, suffered a decline of 20.4 per cent. in output, due principally to the disarrangement of the market.

The average price of pure tin in London during 1907 was £173 15s. ($834) per metric ton, which would give the Bolivian *barrilla* a value of $467 per ton. Deducting from this value the cost of shipping to Europe, shows the *barrilla* to be worth about $0.42 per kg., which would seem to be remunerative. It is expected that the completion of certain new railroads now under construction in Bolivia will reduce both the cost of operating the tin mines and the expense of shipping the product. It is also suggested that if more of the concentrated ore were smelted in Bolivia, a considerable financial advantage would result.

The safety of a coal mine is increased by having the area of all over-casts the same as the entries, and by driving all breakthroughs the same size as the air courses. It is also advisable to keep the haulage roads and air courses free from rubbish; to forbid the use of coal dust as a mine-track ballast, and keep a careful watch over ignorant labor.

A good mixture for fire-proofing woods and cloth consists of sulphate of ammonia, 135 grams; borate of soda, 15 grams; boric acid, 5 grams; water, 1000 grams.

Mineral Production of British Columbia

Official Returns from the Leading Mineral Province of Canada. Decreased Production of Gold, Silver and Lead but Gains in Coal and Coke

BY ERNEST JACOBS*

The Minister of Mines for British Columbia in his annual report for the year 1907, which has just been issued, sums up the mineral production of the Province in several statistical tables. The total production value from the first record up to the end of 1907 is shown in Table I.

I. TOTAL PRODUCTION OF BRITISH COLUMBIA.

Gold, placer	$ 69,549,103
Gold, lode	45,070,717
Total gold	$114,619,820
Silver	27,289,833
Lead	19,917,197
Copper	43,713,122
Other metals	320,699
Total metalliferous	$205,860,671
Coal and coke	$ 86,972,511
Building stone, bricks, etc	6,693,100
Total non-metalliferous	$ 93,665,611
Total production	$299,526,282

In 1890, the first year for which a separate record is given, the total value of the mineral production was $2,608,803, or less than one-tenth of that recorded below for 1907. A comparison of the production for four years past is given in Table II.

The values, of course, vary with the prices of the metals from year to year. As regards quantities, the production of placer gold last year—41,400 oz.—was the smallest reported since 1898; that of lode gold was the lowest since 1900. Silver was less than in any year since 1895, and lead less than in any year since 1904. Copper output was greater than that of any previous year since 1906. The coal output in 1907 was the largest ever made; coke had only been exceeded once, in 1905.

Production by Districts

The total production by mining districts and divisions is valued for three years as in Table III.

These figures indicate a gradual decrease in Cariboo district, where production is restricted to placer gold; a net increase in Cassiar, in the Skeena division of which there was a substantial increase in the production of copper, but offset to a considerable extent by a decrease in placer gold; a net increase in East Kootenay, altogether in coal and coke in excess of the falling off in the production of both silver and lead; a net increase of about $132,600 in West Kootenay, in which district Ainsworth, Nelson, Slocan and Lardeau divisions all produced more silver and lead than in 1906, and Nelson and Rossland more copper, while the last-mentioned camp experienced a decrease in the total gold value of its ores to the extent of about $223,000, and this notwithstanding that there were some 6400 tons more ore produced; a loss of about $5000 in Lillooet district, in which the yield of placer gold has been steadily declining for several years; a decrease in Yale district, in the Greenwood and Grand Forks divisions of which there was less gold and silver recovered from the low-grade ores mined in them, although the copper contents of about 1,170,000 tons of ore mined and smelted averaged not much less than in 1906, and with an addition of about $50,000 for coal mined in the Nicola valley, where production of this mineral was commenced late in the year; and an increase of $760,000 in the Coast districts where (on Vancouver island) a larger production of coal considerably more than compensated for a decrease of 134,000 tons in tonnage of gold-copper ore with the consequent loss of nearly $500,000 in lode gold, silver and copper combined.

Comparison with Other Provinces of Canada

Table IV shows the mineral production of British Columbia in 1907 in compari-

II. MINERAL PRODUCTION OF BRITISH COLUMBIA, FOUR YEARS, 1904-1907.

	1904.		1905.		1906.		1907.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold, placer Oz.	.....	$ 1,115,300	.....	$ 969,300	.....	$ 948,400	.....	$ 828,000
Gold, lode Oz.	222,042	4,589,608	238,660	4,933,102	224,027	4,630,639	196,179	4,055,020
Total gold	.....	$ 5,704,908		$ 5,902,402		$ 5,579,039		$ 4,883,020
Silver Oz.	3,222,481	1,719,516	3,439,417	1,971,818	2,990,262	1,897,320	2,745,448	1,703,825
Lead Lb.	36,646,244	1,421,874	56,580,703	2,399,022	52,408,217	2,667,578	47,738,703	2,291,458
Copper Lb.	35,710,128	4,578,037	37,692,251	5,876,222	42,990,488	8,288,565	40,832,720	8,166,544
Total metalliferous	.....	$ 13,424,335		$16,149,464		$18,432,502		$17,044,847
Coal, long tons	1,253,628	3,760,884	1,384,312	4,152,936	1,517,303	4,551,909	1,800,067	6,300,235
Coke, long tons	238,428	1,192,140	271,785	1,358,925	199,227	996,135	222,913	1,337,478
Building materials, etc.	.....	600,000		800,000		1,000,000		1,200,000
Total values	.....	$ 18,977,359		$22,461,325		$24,980,546		$25,882,560

III. BRITISH COLUMBIA PRODUCTION BY DISTRICTS.

Districts.	1905.	1906.	1907.
Cariboo Division	$300,000	$355,800	$306,500
Quesnel Division	96,000	39,600	44,000
Omineca Division	10,000	10,000	10,000
Total Cariboo District	$406,000	$405,400	$360,500
Cassiar District	504,372	555,999	572,809
East Kootenay District	5,339,154	5,171,024	5,548,880
Ainsworth Division	$100,273	$268,111	$364,868
Nelson Division	532,564	515,709	614,395
Slocan Division	970,544	532,228	619,842
Trail Creek Division	3,672,828	3,223,587	3,049,702
Other Divisions	145,650	120,717	144,169
Total West Kootenay	$5,421,859	$ 4,660,352	$4,792,976
Lillooet District	32,584	20,314	15,721
Osooyoos, Grand Forks and Greenwood Divisions	$6,356,410	$8,698,470	$8,354,995
Similkameen Division	1,533	2,624	56,564
Yale Division	125,561	78,617	32,767
Total Yale District	$6,483,504	$8,779,711	$8,444,326
Coast Districts	4,273,852	5,388,146	6,147,348
Total values	$22,461,325	$24,980,546	$25,882,560

The Coast districts include Nanaimo, Alberni, Clayoquot, Quatsino and Victoria divisions.

*Editor, *British Columbia Mining Record*, Victoria, B. C.

son with that of other provinces of the Dominion, leaving out miscellaneous minerals.

IV. BRITISH COLUMBIA AND OTHER PROVINCES.

	Yukon.	British Columbia.	Other Parts Canada.
Gold	$3,150,000	$ 4,883,020	$ 231,745
Silver		1,703,825	6,625,396
Copper		8,166,544	3,312,100
Lead		2,291,458	
Iron		4,500	2,023,714
Nickel			9,535,407
Coal		6,300,235	14,799,792
Coke		1,337,478	2,148,478
Totals	$3,150,000	$24,687,060	$38,676,632

It will be seen that in gold, copper and lead, British Columbia's production is larger than that of all the remainder of the Dominion combined. Formerly it was in silver as well, but the great increase in Ontario has placed that province far in the lead as regards this metal. No nickel is produced in British Columbia, and practically no iron. The Province's proportion of the total of coal and coke is steadily becoming larger.

Progress of Mining

From the Provincial Mineralogist's review of the progress of mining the following information is summarized:

The value of the mineral production of the province for the year 1907 is greater than that of any preceding year, and it shows an increase equivalent to 3.6 per cent. over that of 1906, to 15.2 per cent. over 1905, and 36.3 per cent. over 1904. The ore mined, exclusive of coal, was 1,804,114 tons, which was produced by the various districts in the following proportions: Boundary (Greenwood and Grand Forks divisions), 65.1 per cent. of total; Rossland, 15.8; Fort Steele division of East Kootenay, 8.6; Coast, 4.7 per cent.; all other districts, 5.8 per cent. The number of mines from which ore was shipped was 147, but of these only 72 shipped more than 100 tons each. There were 36 mines that shipped in excess of 1000 tons each; of these 11 were situated in the Boundary district, 8 in Nelson, 6 on the Coast, 4 at Rossland, 3 in Fort Steele division, 3 in the Slocan, and 1 in the Lardeau. The number of non-shipping mines is 61. There were employed in the shipping (metalliferous) mines, 3697 men; in the non-shipping mines, 246; in the coal mines (including Japanese 174, Chinese 743, Indians 23 and boys 205) 6059; total, 10,002 men.

Taking the Province as a whole, there were 488 tons of ore mined for each man employed about the metalliferous mines; in respect to districts, however, the tonnage per man was as follows: Slocan, 59 tons; Nelson, 179 tons; Trail Creek (Rossland) 387 tons; Boundary, 946 tons.

In connection with the several minerals constituting the production of the province, the following notes have been extracted from the much fuller comment appearing in the report:

Gold

The production of placer gold was $828,000, a decrease of $120,400, or 12.7 per cent., as compared with 1906. Nearly half of this amount was from Atlin camp, where the companies contributed about 70 per cent. and individual miners 30 per cent. of the production of the camp. Dredging for gold has been abandoned at Atlin, but a large steam shovel was successfully used in filling cars with gravel for conveyance to a washing apparatus. Cariboo district contributed $360,500, as follows: The remainder of the total production came from the Cassiar, other divisions than Atlin, $25,000; East Kootenay, Fort Steele division, $10,000; Lillooet (Fraser river), $12,000; Revelstoke, $5000; smaller yields, $6000. The lower Fraser and Thompson rivers have almost ceased to produce gold.

The total of lode gold was $4,055,020, a decrease of $575,619, or about 12.5 per cent. The chief individual decreases were in the Boundary district, nearly $267,000; in Trail Creek division (Rossland), about $223,000; in Lardeau division, $18,000, and on the Coast, $103,000. The only increase worth noting was in Nelson, of rather more than $35,000. About 95 per cent. of the lode gold produced was recovered in smelting copper-bearing ores. The only stamp mills operating to an important extent in 1907 were that of the Daly Reduction Company at Hedley, Similkameen, where about 32,000 tons of ore were milled, from which was recovered approximately $475,000; and the Queen mill, in the Nelson division, where some 8800 tons were crushed, producing about $100,000.

Silver

The total quantity of silver produced in 1907 was 2,745,448 oz., a decrease of 244,814 oz. About 72 per cent. of the silver produced was found associated with lead, in argentiferous galena, and the remainder in conjunction with copper-bearing ores, chiefly from the Boundary district. Slocan district, including Ainsworth division, contributed 32 per cent. of the total output, and Fort Steele division of East Kootenay some 30 per cent., all from argentiferous galena. The output of the latter district was less than in 1906 by 246,000 oz., and of the Boundary by nearly 203,000 oz. On the other hand, the Slocan made a gain of nearly 155,000 oz., the Lardeau about 43,000 oz., and Nelson 25,000 ounces.

Lead

The production of lead was 47,738,703 lb., a decrease as compared with 1906 of 4,669,514 lb. Nearly 79 per cent. of the production was in Fort Steele division, and between 16 and 17 per cent. in the Slocan. By far the larger part of the output of Fort Steele division was from the St. Eugene mine, while the Sullivan was the only other important producer in that part of the province. In the Slocan, the Whitewater was the largest shipper, with a production of between 2,000,000 and 3,000,000 lb. The Rambler-Cariboo, Ruth, Standard, Vancouver group, and Hewitt were the other chief producers in the Slocan. La Plata in the Nelson division, and the Silver Cup in the Lardeau, also shipped a considerable tonnage of silver-lead ore.

Copper

This metal had a total production of 40,832,720 lb. The decrease was 2,157,768 lb. The larger decreases were: Coast, 2,054,920 lb.; Boundary, 705,232 lb.; and Ashcroft-Kamloops, 319,257 lb. The increases were: Skeena division of Cassiar district, 381,618 lb.; Rossland, 330,165 lb.; and Nelson, 218,188 lb. The larger copper-producing mines—those of the Boundary—were not operated the full year, but only about nine months, owing first to a shortage of coke having interfered with the regular running of the smelters and next to the considerable fall in the price of copper toward the close of the year.

The average assays of the copper ores of the various camps, based upon the copper recovered, were as follows: Boundary, 1.34 per cent.; Coast, 1.99; Rossland, 0.885 per cent.

Iron

There was practically no iron ore mined in 1907—only some 1500 tons of bog-iron ore at Quatsino sound, Vancouver island. The iron deposits of this island were examined last summer by an expert sent out by the Dominion Department of Mines, but his report has not yet been published.

Zinc

But little zinc ore was mined in 1907, but 1120 tons of Lucky Jim (Slocan) ore, mined in 1906, were shipped to the United States. A certain quantity of zinc concentrates is obtained every year from lead ores, in which zinc blende occurs in association with galena. At the Blue Bell mine, on Kootenay lake, large quantities of zinc ore have been opened up and the erection of a concentrating mill to treat it well advanced. Zinc occurs in the Whitewater and Whitewater Deep mines, Slocan, in conjunction with lead, and a zinc product is being made when milling the lead ore. The zinc smelter erected in Alberta, for the treatment of British Columbia ores has not yet been operated on a commercial scale. The Canada Zinc Company is installing a plant at Nelson to treat complex galena-zinc ores by a process of electric smelting under the Snyder patents, whereby it is hoped to recover the lead and zinc in metallic state, and also save the silver.

Coal and Coke

The gross output of coal for the year was 2,219,608 tons (2240 lb.), an increase of 320,532 tons over the production of 1906. The quantity made into coke was 419,541 tons. The output of coke

was 222,913 tons, against 199,227 in 1906. While the net production of coal was the highest, by 320,532 tons, of any year of the 72 years since coal mining was commenced in the province, that of coke was 23,686 tons less that in 1905, when a record was made with an output of 271,785 long tons. Though coal mining in the province has been extended over the comparatively long period above mentioned, operations were but small until comparatively recent years, the production during all years up to 1887, inclusive, having totaled only 3,769,007 tons, while in the next 10 years a total output of 8,312,680 tons was made, and in the last 10 years, (1898-1907) 13,863,013 tons.

Of the net production last year, 916,262 tons were sold for consumption in Canada, 651,076 tons for export to the United States and 22,038 tons to other countries. The remaining 165,931 tons were used under colliery boilers, etc. Of the coke, 155,579 tons were sold in Canada, 60,110 tons exported to the United States, and the balance of 7224 tons added to stock.

The chief producing collieries of the province in 1907 were on Vancouver island, the Western Fuel Company's No. 1 Shaft, Esplanade, Nanaimo, and Protection Island mine, worked as one mine, and its No. 4 Northfield mine; and the Wellington Colliery Company's Extension and Union collieries; in the Crow's Nest Pass, the Crow's Nest Pass Coal Company's Coal Creek and Michel collieries. Several new mines were opened, the most important of which is that of the Pacific Coal Company, a Canadian Pacific organization at Hosmer, in the Crow's Nest Pass district; others are two at Nicola, in Yale district and three or four on Vancouver island. The net production of the several collieries is given in Table V. in long tons.

V. COAL AND COKE.

	Coal.	Coke.
Western Fuel Co. mines	504,292	.....
Wellington Colliery Co. mines.	727,647	16,372
Small mines	3,579	.....
Total, Vancouver Id.	1,235,518	16,372
Crow's Nest Pass Coal Co.	553,861	206,541
Nicola Valley Coal and Coke Co.	10,868	
Total mainland	564,729	206,541
Total	1,800,247	222,913

Some smaller mines at Nicola and on Vancouver island are producing coal, but the Pacific Coal Company's big mine will not make any output for sale until the beginning of 1909.

Other Minerals

In several directions a little attention was paid to platinum, but the production was small. Oil and oil shales, were practically neglected, owing to lack of transportation facilities in districts in which oil occurs. More building stone—sandstone, granite and andesite—was quarried. The brickmaking industry was enlarged, red brick, firebrick, and lime-silica brick each having been made in considerably increased quantities. The Vancouver Portland Cement Company sold 143,226 bbl.—350 lb. each—of cement made at its works near Victoria, Vancouver island. A larger quantity of lime was made on the Coast, and an increased demand was made for marble from quarries on and near Kootenay lake, chiefly for building purposes.

General

The report under notice contains, beside the statistical matter and general notes concerning the mining industry of the Province summarized above, much information from gold commissioners, mining recorders, and other officials. There are also accounts by the provincial mineralogist of different camps visited. A number of reproductions of photographs, diagrams and sketch maps illustrate the report.

Transvaal Stope-drill Competition in 1909

A six months' contest for stope drills is to be held in the Transvaal mines beginning about April 1, 1909, under the supervision of a committee selected by the Transvaal Government and the Transvaal Chamber of Mines. The object of the competition is to obtain a small drill capable of economic use in the narrow stopes on the Witwatersrand, and the conditions have heretofore been made as practical as possible. Two prizes will be awarded: The first prize, £4000, to the machine for which the total cost (including first cost, wages, air, water, drill sharpening, maintenance, and stores) when divided by the total footage drilled is least; and a second prize of £1000 to the machine with a record next in order. Prizes of £300, £200 and £100 will also be awarded to operators of the machines, the operators to be selected by the committee.

The conditions for the contest have been carefully prepared to eliminate unfairness and tampering with the results. Each competitor is required to furnish three machines with all necessary parts and accessories, and to appoint a representative who must be in Johannesburg during the preliminary trials and during the competition. The machines must weigh 100 lb., or less, and will be operated with an air pressure of 60 to 75 lb. per sq.in. All entries must be accompanied by detailed specifications and drawings and lists of prices of machine parts and accessories. In all the tests the holes must be between 42 and 48 in. deep, to be drilled with not more than four steps of gage, and finishing with a diameter of 15/16 in. Each machine must have a device for taking care of the dust.

There will be two elimination trials, one on the surface and one below ground, before the actual competition. The surface trial will prove the ability of the machine to drill down holes in granite, and only those which have passed the surface trial will take part in the underground trial. The under-ground elimination trials will last three periods of eight hours each.

At the end of the elimination trials, the committee will arrange the competitors in order of merit with regard to footage drilled and air consumed, and will then decide which may enter for the competition. During the competition the machines will be absolutely under the control of the committee, which will determine all the details of the work, select the operators, issue supplies, test the efficiency in every possible way, keep records of costs, repairs, results, etc.

Entries must be received before December 31, 1908, by the "Secretary to the Committee, Transvaal Chamber of Mines, Johannesburg, Transvaal." Full particulars and forms upon which the entries must be made may be obtained from either the Transvaal or the London secretary of the Transvaal Chamber of Mines.

Disposition of Alaska Gold

Special Correspondence

By a recent order or ruling of the Treasury Department, becoming effective June 10, payment for gold deposited in the United States assay office at Seattle, Washington, must be made in gold coin or bars, whereas heretofore it has been largely made with Eastern exchange. A large portion of the gold shipped from Alaska and the Klondike comes to Seattle by registered mail, and it would cost no more to send it direct to the mint at San Francisco. If the new order stands, therefore, it is expected that the receipts of gold from Alaska will fall off materially at the assay office in Seattle, with a corresponding increase in the Alaska deposits at the mint in San Francisco. The gold received from the North at Seattle eventually finds it way to the mint at San Francisco for coinage, in any event, as there is no mint at Seattle. Heretofore the Alaska deposits at Seattle far exceeded those at San Francisco. The assay office made this gold into bars and shipped it to San Francisco to be coined. Under the new order a large proportion of the Alaska gold will go direct to San Francisco for coinage.

Three methods of mining are used in the Cœur d'Alene, viz., (1) backstoping and timbering; (2) backstoping, timbering and filling; (3) backstoping and filling without timbering.

A safety catch should be equally reliable in its action whether the rope breaks on the ascending or descending trip.

The Behrend Dry Concentrator

Dry concentrators are, as a rule, more difficult to adjust and regulate than those using water; in addition the dust which is raised in and about the mill where they are employed is a serious objection. The dry concentrator, manufactured by the Behrend Dry Concentrator Company, 10 Wall street, New York, is planned to overcome these difficulties by the simplicity of adjustment and by drawing the air over the surface of the table, through hollow perforated riffles into the body of the machine.

The ore, crushed to 8 to 10 mesh size, is fed from a hopper *H* (Fig. 4), and distributed evenly over the upper end of the table, inclined 1⅜ in. per ft. An eccentric *C* gives 650 impacts per minute to the table and keeps the ore in constant agitation. Thus a bed is formed (Fig. 2) with the grains arranged according to their specific gravities. The movable, upper part of the machine consists of an air-tight box formed by the surface, the sides and an adjustable wooden plate called the "dressing-plate." The exhaust fan *M* draws air through the perforated riffles, the inlet being at *A* (Fig. 4). As the ore moves down the inclined table the lighter grains are retarded by the incoming current of air and are lifted clear of the surface. On falling back they are sucked through the hollow riffles, of which there are 19, and fall upon baffle boards *F F* inside the machine; thence they are discharged at *B* in the front of the base. The dust is drawn through the fan and discharged into the open air, or into suitable dust-settling chambers. The air pressure is so regulated—by raising or lowering the dressing-plate—that the heavier grains are not lifted high enough to be sucked into the riffles and consequently they pass down between them to the discharge opening *A*, which is also the inlet for the air. The regulation of the volume and pressure of the incoming air to suit the material being dressed is the key-note of the process.

The riffles are made of thin sheet metal, the edges being sunk into slots in the surface. The hight of the riffle varies from 5/16 in. at one end to 9/16 in. at the other. The ends are closed and drawn to a point. Holes are punched through, as close together as possible, leaving the punched metal to form a lip as shown in Fig. 3.

The principal adjustments are three in number. The lever *G* (Fig. 4) raises or lowers the dressing-plate *E*, thereby varying the pressure, the volume remaining constant; a valve inside the frame regulates the volume of air drawn in by the fan; the third adjustment regulates the quantity of ore fed upon the table.

Each machine occupies only 21 sq.ft. of floor space, has a capacity of 5 to 10 tons per 24 hours, and requires ¼ horse-power.

While it is not necessary to have the ore bone dry, still, it is essential to remove all but a few per cent. of the moisture. Hence, it is frequently necessary to install drying apparatus in connection with this concentrator.

FIG. 2. FLOW OF AIR AND BEDDING OF GRAINS

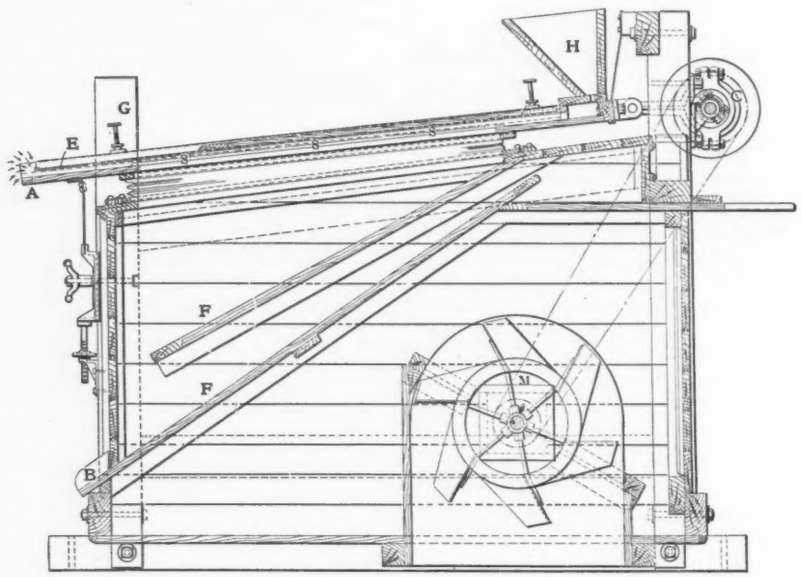


FIG. 4. LONGITUDINAL SECTION THROUGH CONCENTRATOR SHOWING CONSTRUCTION

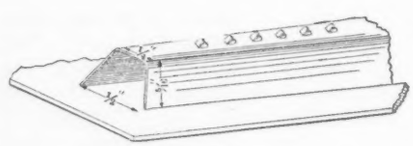


FIG. 3. DETAIL OF HOLLOW PERFORATED RIFFLE

Copper in the Dominican Republic

According to a British consular report, copper ranks next in importance to gold in the Dominican Republic. Several lodes are believed to be profitably working in Mount Mateo, Nigua river, in the province of Santo Domingo; the ore of these mines is said to yield from 30 to 33 per cent. copper. In Recodo, in the province of Santo Domingo, there are several copper lodes, as well as in Pedro Brand. In the province of La Vega, at Cotuy and Bongo, there is also copper-bearing quartz.

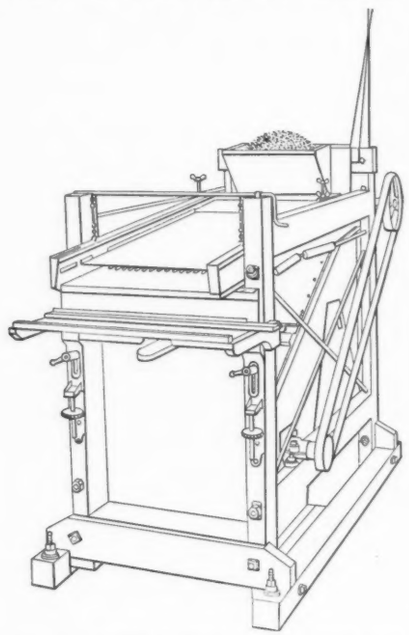


FIG. 1. GENERAL VIEW OF CONCENTRATOR

These deposits have not been developed, but they seem to be rich. There is also a copper mine in Asiento Frio, district of Monte Cristi, and one in the Rio Arriba section of the province of Azua.

According to William P. Blake, the geologist and mineralogist of the commission sent to Santo Domingo by the United States Government in 1871, "ores of copper occur on the southern flank of the mountains between Azua and the river Jaina." The beds are said to compare favorably with similar deposits in California.

Manganese and iron ores are common in many parts of South Australia. The ores frequently contain cobalt, but not in workable quantities.

Consul-General F. R. Mowrer, of Copenhagen, states that investigations have disclosed veins carrying rich gold ore in the vicinity of Reykjavik, the principal port of Iceland.

The Chemistry of Silver Sulphide Cyanidation*

By W. A. Caldecott

The primary reaction in the dissolving of silver sulphide from its ores may be taken as: (1) $Ag_2S + 4\,NaCy = 2\,NaAgCy_2 + Na_2S$. When, however, a certain amount of silver has been dissolved by the above reaction an equilibrium is established and solution ceases. How far the reaction has proceeded before this equilibrium is attained, depends on the amount of soluble sulphide in solution, whether derived from silver sulphide or other sources, and the amount of free cyanide present.

The amount of silver sulphide capable of being dissolved as a soluble double alkaline cyanide is approximately proportionate to the amount of free cyanide present. With 0.5 per cent. solution the quantity of dissolved silver is less than 0.5 oz. per 2000-lb. ton.

The introduction of soluble sulphides into an argentiferous cyanide solution by means of a free alkali in any mineral or other source results in the precipitation of silver already dissolved. The fact that dissolved silver and other than very small amounts of sodium sulphide cannot exist simultaneously in the same solution explains why working solutions do not show more than traces of the latter when sulphide ores are being treated. With solutions low in silver it is difficult to filter off the very finely divided suspension or colored colloidal precipitate, formed on addition of sodium sulphide solution to the sodium argento-cyanide solution.

The soluble alkaline sulphide first formed in the vats is converted into other compounds which do not preclude the further solution of silver, and thus the primary reaction appears to be merely a transition state in the sequence of reactions. No doubt, several of these secondary reactions proceed simultaneously. The formation of the resultant products has been proved by their detection in the solution.

The secondary reactions are as follows:

$$(a)\quad \begin{cases} 2\,Na_2S + 2\,O_2 = Na_2S_2O_3 + Na_2O & (2) \\ Na_2S_2O_3 + Na_2O + 2\,O_2 = 2\,Na_2SO_4 & (3) \end{cases}$$

$$(b)\quad Na_2S + NaCy + O = NaCyS + Na_2O \quad (4)$$

$$(c)\quad \begin{cases} Na_2S + PbO = PbS + Na_2O & (5) \\ PbS + NaCy + O = NaCyS + PbO & (6) \end{cases}$$

These reactions, when carried to completion, all involve the absorption of oxygen and indicate the utility of aeration, which in practice is obtained by lengthy agitation in the vats.

Reaction (*a*) apparently proceeds a good deal more rapidly than (*b*). Since it does not involve a destruction of cyanide, and is not required to proceed further than the first stage, resulting in the production of sodium thiosulphate, which is itself a silver solvent, this may be considered the most desirable result of aeration.

Reaction (*c*), with lead present as suspended hydrate, or soluble alkaline plumbite, has the advantage of instantly converting the soluble into insoluble sulphide, and also, the reaction being cyclical, given sufficient oxygen, a limited quantity of lead salt serves to remove an indefinite amount of soluble sulphide. This last result, however, is only attained at the expense of free cyanide being converted into useless sulpho-cyanide. If lead peroxide could be employed as soluble alkaline plumbate, a double quantity of soluble sulphide should be removed as sulpho-cyanide and insoluble sulphide.

A study of the molecular weights involved in the equation $Ag_2S + 4\,NaCy = 2\,NaAgCy_2 + Na_2S$ shows that the silver requires nearly its own weight of sodium cyanide to dissolve it, so that the consumption from this cause alone with 500 gm. silver ore would be nearly a pound of sodium cyanide per ton. This feature, as one of the sources of high cyanide consumption experienced with silver ore, renders the field for cyanide regeneration processes a good deal more promising than with South African banket gold ores, with which the total cyanide consumption need not necessarily exceed a very few ounces per ton.

Apart from the reactions taking place in the presence of lead salts, the absorption of oxygen in reactions (*a*) and (*b*) is considerable. Even at the stage of reaction (2) it amounts to one-seventh of the weight of the silver dissolved. Hence, under these conditions, although oxygen does not play the direct part in dissolving the silver that it does in gold-ore treatment, its importance in permitting solution to proceed, and the present necessity for the slow and tedious process of repeated agitation and aeration appear evident.

Silver sulphide agitated in a cyanide solution with the oxidizer barium dioxide, or with air under 100 lb. pressure, shows considerably more silver dissolved in a given time than in the absence of either.

A solution of lead plumbite containing 1.95 per cent. Pb O, prepared by dissolving precipitated lead hydrate in caustic soda solution, when added to the cyanide solution prevents the precipitation of silver, and consequently facilitates the dissolving of silver sulphide in spite of the concurrent formation of soluble sulphide. Mercury salts probably act in a way similar to lead salts in forming an insoluble sulphide, though but little used on account of their higher cost. Possibly, also, a direct replacement of mercury in the double alkaline cyanide by silver takes place, as is claimed by Keith and Hood. It is believed that only mercury in the mercurous state assists in the dissolution of the silver. Consequently, it would appear that the use of calomel should be preferable to that of mercuric chloride.

*Abstract from paper entitled, "Some Features of Silver Ore Treatment in Mexico;" *Journal* of the Chem., Met., and Mining Society of South Africa, March, 1908.

Estimation of High Temperatures

In metallurgical operations it is often useful to be able to regulate the heat within a specific limitation. This may, of course, be done by the use of a pyrometer. But in works where it is not necessary to keep such delicate instruments on hand it is sometimes desirable to measure temperatures with a fair degree of accuracy. Many simple methods capable of yielding approximately accurate results have been proposed by various metallurgists. An effective method which has been used for many years with satisfactory results has been developed by Dr. F. W. Skirrow, of Manchester, England.[1] Whenever he desires to carry out a thermal operation at a specific temperature he secures a substance having a definitely ascertained melting point at the desired temperature and another with a melting point a little higher. Each substance he places in a narrow steel tube of any suitable length with one end sealed up. A stiff wire is placed in the tube and one end is fused into the fusible substance at the bottom of the tube while the other end protrudes from the open end of the tube. This wire remains fixed to the substance at the bottom of the tube so long as the temperature remains below its melting point. When, however, the substance melts, the wire becomes loose and can be freely moved up and down the tube.

If a number of such tubes are prepared with numbers or other identification marks stamped on them and containing a series of substances covering the various temperatures within whose melting point range a metallurgist desires to work, very effective work can be done, notwithstanding the cheapness and simplicity of the indicators.

In practice it is found only necessary to use two such tubes in order to keep a fire at a specific temperature. The fireman needs to regulate the firing so that one wire is loose while the other fused in the substance with a slightly higher melting point than the described temperature remains fixed and cannot be moved up and down the tube.

Whenever it is desirable for any reasons to avoid the use of iron or steel tubes, tubes made of other materials may be employed. When tubes made of refractory substances, as earthernware or porcelain, are used, it is necessary to take into account the greater temperature lag of such substances.

[1]From the *Journal* of the Society of Chemical Industry, May 15, 1908, p. 434.

Mineral Production of China in 1907

The Empire Has Abundant Resources but the Mineral Industry Is Slow in Developing and Little Information is Available

BY THOMAS T. READ*

Since the travels of Marco Polo brought the far East to the attention of western nations it has been generally believed that China possesses great mineral resources, for some of which the Chinese were the first to devise a use, as in the manufacture of porcelain. But the extent of the resources and the amount of annual production is still but vaguely known. Several causes contribute to produce this state of affairs, some of them fairly obvious, others less so. No small proportion of China is still insufficiently explored by Westerners because of the great difficulty attending travel inland along any except the very few highroads. Explorers, of whom regretably few have been competent to pass on mineral resources, have generally confined themselves to what could be seen adjacent to the main lines of travel, or learned from the natives along the road. The western world is, therefore, only partly aware of what is known to the natives. But, in addition, no small part of the mineral resources are also unknown to the natives of the country who are an agricultural people, dwelling on the plains, the mountain regions being comparatively uninhabited. They are also deterred by a superstitious reluctance to make excavations, especially in high places, for fear of offending the spirits of earth and air. Anything like an adequate knowledge of the mineral resources of the Chinese Empire will not be possible for a long time to come.

In regard to the actual present production no less uncertainty exists. No organized statistical work is undertaken, either by the national or provincial governments, the annual reports of the customs dealing only with foreign trade, and containing little of value from this standpoint. Records of the transit or *likin* tax would furnish partial information for the localities where it is imposed; but such records are either not kept, or are not available, or are so fragmentary as not to be of service. Even if it were by any means practicable to make a personal investigation of the producing areas, the attempt would be almost equally fruitless, for the Chinese do not regard an individual business as a proper subject of public inquiry, and take care to prevent exact knowledge of the amount of their production gaining circulation, as being likely to lead to increased taxation.

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The attempt is now being made in a somewhat desultory fashion to put into working order a system of supervision of mining operations. There is to be a mining bureau in each of the eighteen provinces, the whole being under the control of a central national mining bureau. One of the phases of its work will be the collection of accurate statistics of production. As yet only one province (Ssüchuan) has made much progress in putting this in operation, and apparently little has been done there beyond appointing a commissioner of mines, and a Chinese mining engineer (educated in the United States) as provincial geologist.

From the foregoing it must be clear that, beyond citing the production of such companies as are under foreign control, and estimating the total production within very wide limits of error from such fragmentary data as can be gathered, little can be given except a general discussion of the subject.

Building Material

The largest single item in the list of mineral production is undoubtedly building material. This is chiefly brick and tile; for, except in large public works, building stone is used only to a very limited extent, and the production of cement is confined, so far as known, to a single company with an output of the value of $150,000 annually. This figure, as well as those used later in this article, is in terms of United States currency. By ascertaining the production of an area of 1,000,000 inhabitants, and multiplying by the accepted figure for the population of China, it is estimated that the production of building material in 1907 was about $100,000,000. This estimate is probably correct within 25 per cent.

Most of the brick used in China is soft mud brick, made in native kilns. The red color of brick burned in the usual way is not pleasing to Chinese eyes; so in the native kilns the bricks are burned in a reducing atmosphere, secured by the use of smoky fuel. At the close of the burning the bottom of the kiln is tightly closed, and a quantity of water is poured on the top to cool the brick so quickly that they shall not have opportunity to oxidize. This produces a brick of a pleasing gray color, but decidedly lacking in strength. Little care is taken in molding, and the quality seems to deteriorate yearly rather than to improve.

In and adjacent to the treaty ports there are many kilns producing both molded and pressed brick of quality equal to the foreign product and there is at least one company making sand-lime brick, but the latter does not seem to be much in demand. Tiles are made in native kilns.

The cement company referred to above is owned by Chinese, operated under German supervision, and equipped with American machinery of the latest type. The product is of excellent quality.

Coal

Next in importance is the production of coal, both bituminous and anthracite. I am indebted to Dr. N. F. Drake of the Department of Geology of the Imperial Pei-Yang University, for an estimate of the total annual production which he places at 15,000,000 tons, with a value of $75,000,000. The probable error is again about 25 per cent. A very large part of this is the aggregate of many small native producers, but there are also many large producers under foreign control or supervision.

The largest of these is the Chinese Engineering and Mining Company organized nearly 30 years ago. The company is largely British, although Chinese capital is also involved. There are three mines at Tongshan and Linsi, about 50 miles northeast of Tientsin, in Chili province. The production of these mines was a little more than 100,000 tons in 1881, and has steadily grown to 1,118,000 tons in 1907. The mines are well equipped, an electric plant of more than 3000 kw. capacity having just been installed for lighting, pumping and hoisting underground. The product of the mines goes to supply the Imperial railways of north China, the coasting and trans-Pacific steamship lines, the neighboring cement, fire-brick and brick industries, and for domestic and industrial purposes in the near-by city of Tientsin. The coal dust is also made into coke, of which it furnishes a good grade.

The next largest producers are the government mines at P'inghsang in the province of Kiangsi. These supply coal and coke to the government iron works at Hanyang, across the river from Hankow. The mines at present have a capacity of 500,000 tons per year, but are being developed to a capacity of 1,000,000 tons. The exact production in 1907 could not be ascertained. About 80 per cent. of the product is manufactured directly into coke. The mines are under German supervision and are worked according to Western methods, the haulage being by electric power in the main entries. The surface

plant includes two washing plants; for the coal, like most Chinese coals, is rather high in ash. In addition to the coke ovens there are a briquetting plant and fire-brick kilns. The product goes by standard gage railroad 60 miles west to Chu-chou on the Siang river, whence it is sent by lighter 280 miles to Hanyang.

Coalfields of China

The mines owned by the Shantung Bergbau Gesellschaft, at Fangtze and Poshan, near Tsinan-fu in Shantung, are also large producers, the total for 1907 being 180,000 tons. These mines have also a washing plant, and operate through several shafts. The region is cut by intrusives, which have seriously affected the coal in places. In 1907 the company had a mine explosion, probably the first case in China, and had some little difficulty in obtaining miners afterward. The product finds a ready sale at Kiaotschou, with which it is connected by railroad.

The mines at Linchêng in western Chili are connected with the Peking-Hankow railroad by a branch line 14 miles long, and supply that line with coal. A request for a statement of production elicited no response, but it is probably not yet much in excess of the needs of the railroad. The mines are under foreign supervision.

A large native mine at Ching-hsing in Shansi supplies the branch line to Taiyuan fu with coal, and also produces coal and coke for the general market. German capital has lately been interested, and the production is being increased. The production could not be ascertained, but is probably in the neighborhood of 100,000 tons. The name of these mines is usually incorrectly given as Ching-ching.

Large numbers of native mines are found near Tzechou in Shansi, Lingshan in Chili and also directly west of Peking. The coal from the latter is anthracite. The coalfields of north China have been described in some detail by Drake. In addition to the areas described there are large coalfields in Kansu, but little is known of them. Accurate detailed information is lacking regarding the southern provinces. The largest fields are in Honan, of which they cover a large part of the south and east portions, extending into Kiangsi. The coals are bituminous in the northern edge of this field and anthracite in the south.

In Kuangtung coal occurs at Sha-chou-fu, Kuang-cha-fu and along the border of the gulf of Tonking. In Hupeh coal occurs at Wuch' ang fu and at Siang-yang fu. There is a large field at Wan-hsien in Ssüchuan, which a foreign company is beginning to work. Coal also occurs in Honan, Kiangsu, Kweichow, Kwangsi, Fokein and Chêkiang provinces, but is either not much worked or little is known regarding it. The Japanese are engaged in developing coal mines in Manchuria, at Yentai and other places. The total acreage of coalfields in China far exceeds that of any other country of the world.

Iron Ore

Iron ores occur in 11 of the 18 provinces, and are extensively worked in five provinces. For reasons previously given it is impossible to make any estimate of the amount and value of the production. Deposits in Shansi are extensively worked to supply numerous small local furnaces, while others in Honan and Hupeh supply both local furnaces and the government iron works at Han-Yang. The government iron works of Japan also draw their supplies of ore from China, Anhwei and Kwangtung being the chief sources. The Germans are preparing to work the magnetite ores of Shantung. Iron also occurs in Shensi, Ssüchunan, Hunan, Kiangsu and Kweichow, but the deposits are not much developed. When it is reflected that the three most powerful countries of the world are also the greatest producers of iron, steel and coal the future possibilities of China are seen to be enormous.

Gold

The next most important deposits are gold, copper and tin, but their exact relative importance cannot be stated in the absence of definite data. In The Mineral Industry for 1906 the production of gold for the whole of China was estimated at $4,500,000; while the same volume also quoted a Japanese estimate that the annual production of Manchuria alone was $10,000,000. This illustrates the degree of accuracy at present possible. As previously stated, the production is the aggregate of innumerable small producers whose interest it is to conceal the actual amount as much as possible. Knowledge of the deposits is almost equally meager. In Manchuria gold is widespread, both in alluvial deposits, and numerous small quartz veins, from which the former have been derived. These are worked, the former by panning, the latter by heating and quenching the ore to make it brittle, grinding in stone mills and panning the ground product. The methods used bear striking similarity to those used in Europe in the fifteenth century. The industry does not flourish as much as it might for the country is infested with bandits, who relieve the miner of his winnings, and not infrequently of his life. Since the close of the war policing of the country is rapidly progressing, and the production should rapidly increase also.

In Shantung gold exists at various places, the best known being at P'ing-tu where there is a large and valuable deposit of gold-bearing pyrite. This was formerly worked by stamp-milling and amalgamation, but on reaching the zone of unaltered sulphides, this did not give a satisfactory extraction and the mine is now closed down. What "improved methods" in China have to contend with is shown by the fact that the concentrates after having been re-treated could still be sold to the native farmers, who carried them home and occupied their time in the winter by regrinding and panning them.

Gold is known to occur in Kansu, and there are quartz veins in the upper valley of the Han-ho, in Shensi. There is a small amount of gold washing along the Han-ho in Hupeh. Mines were formerly worked in the southern part of Anhwei. There are deposits in Hunan and Kuangsi, but they are not much worked. There are said to be valuable mines in Kuangtung. Gold occurs in Ssüchuan, but knowledge of this very valuable mineral province is extremely scanty.

Tin

Yunnan is the principal producer of tin. The mines are at Kochiu-ch'ang, near Meng-tze. The ores are reduced locally and the "base metal" shipped out through Cochin China to Hong-kong, where it is refined. The value of the output, as given in consular reports for 1906 is $2,500,000. The French railroad from Hanoi, in Cochin China now extends as far as Meng-tze, offering greatly increased facilities for transportation. Tin also occurs in Honan, Kuangsi and Fokien. The production in Kuangsi is small, and that of the others is unknown.

Copper

Copper has been mined in China for thousands of years, but in spite of that fact our knowledge of the industry is very vague. Yunnan and Ssüchuan are the chief producers. Mines are worked in three localities in Kweichow, and the metal also occurs in Shantung, Kuangtung, Anhwei and Hupeh. The mines in Yunnan and Ssüchuan are the property of the government, and the local authorities frequently have no little trouble in persuading the miners to recognize that fact. The production, though large, is insufficient to supply enough metal for subsidiary coinage and brass and bronze ware, so somewhat variable amounts, 235,000 lb. in 1906, are imported.

A few years ago the provincial mints began the coinage of copper *t'ung-erh*, or 10-cash pieces, that were supposed to pass at the rate of 100 to the Mexican dollar. These were so popular that they commanded an even higher rate of exchange than that intended. As the profit in minting at the prices of silver and copper then obtaining was from 200 to 300 per cent. according to the purity of the pieces (zinc was used in the alloy), it was not remarkable that the provincial authorities ran their mints night and day. In 1905 1,500,000 lb. of copper were imported for this purpose, large quantities of silver being exported, although China is usually a heavy buyer of silver. The copper pieces fell rapidly in price, and as the standard of living of the common people is measured in terms of these coins, the social disturbance was so serious that the national government stopped the coinage.

The fall in the price of copper in 1907 has again made the coinage of these pieces very profitable, and large quantities of Japanese copper are made into counterfeit coins and smuggled into China.

Other Mineral Products

Antimony and mercury are two important minor metals in China. Most of the present production of antimony comes from Hunan; there are also deposits in Kiangsi, Kweichow and Ssüchuan. Both ore and metal are exported. Japan and the United Kingdom are the largest buyers. The production should steadily increase, for the manufacture of matches is growing rapidly, both in Japan and China. The value of the exported ore and metal in 1906 is given as $300,000. The actual production is, of course, much larger.

Mercury occurs in various parts of the province of Kweichow. The ore is reduced to metal locally, and the larger part goes to Hong-kong, where it is manufactured into vermilion. No estimate of the production is possible. China has usually been a buyer of mercury but lately small amounts have been exported.

Information in regard to the remaining products is even less satisfactory. Argentiferous lead is produced in Yunnan and occurs in various provinces, notably Kweichow, Hunan, Honan and Kuangtung. Silver occurs in addition in Ssüchuan, but the production is not enough to meet the demand and China is usually a steady buyer of this metal. Yunnan and Ssüchuan are the chief producers of zinc. It also occurs in Hupeh and Kweichow. Nearly $100,000 worth is exported annually, and large quantities are used in the manufacture of brass, etc. Nickel occurs in the upper valley of the Han-ho in Shensi. Petroleum occurs in Kansu and Ssüchuan, but is not exploited.

China is a fairly large producer of precious and semi-precious stones, but there is little definite knowledge regarding them. In carrying out their policy of the Teutonization of Shantung, the Germans have attempted to exploit the diamondfields near I-chang-fu, but so far with little success.

The production of materials for the manufacture of porcelain and other forms of ware is, of course, very important, but such a variety of materials are used in different places and the industry is so scattered that no estimate can be made.

Foreign Capital in China

In conclusion it is necessary to say something in regard to the use of foreign capital in mining. In general, it may be broadly said that, so far as is possible China will grant no more concessions to foreign mining companies, and will employ foreign money in mining as little as may be. China has had many unfortunate experiences with the rather dubious business ability of foreigners, and has learned by experience to *"Timeo Danaos et dona ferentes."* Mining has been no exception to this. The latest case is that of the Peking Syndicate, which a few years ago obtained a blanket concession covering very large and valuable areas in Honan and Shansi. In Honan a short line of railroad has been built and shafts sunk in places where it proved impracticable to work the coal. In Shansi there was no visible result of the activity except the construction of a branch line of railway and the development of such violent opposition on the part of the people of the province that the government was finally obliged to buy back the concession at a cost of $1,700,000. For this the Chinese now have a short line of railroad and the privilege of working their own mines. It is, therefore, not remarkable that the Chinese do not care to encourage foreign capital to enter. The demand for American engineers is likely to grow, for the Chinese capable of directing such work are few, and are generally engaged in constructing the government railroads, which are continually increasing in number, each railroad making a coal mine necessary and other mines possible.

Remarkable Wear of Roll Shells

The accompanying illustrations are interesting in showing the remarkable wear of some roll shells furnished by the Midvale Steel Company, of Philadelphia, Penn. Fig. 1 shows the roller tire of a new Chilean mill and an old one, which had been subjected to about four months' wear on extremely hard ore at the Butte Reduction Works. Fig. 2 shows a series of shells of 30x14-in. rolls in use by the Queen Esther Mining and Milling Company, of Mojave, Cal. When new, the shells were 3¼ in. thick. As shown in Fig. 2 they were worn down to about ⅛ to 1/16 in. thickness. In both cases some new shells are shown for comparison.

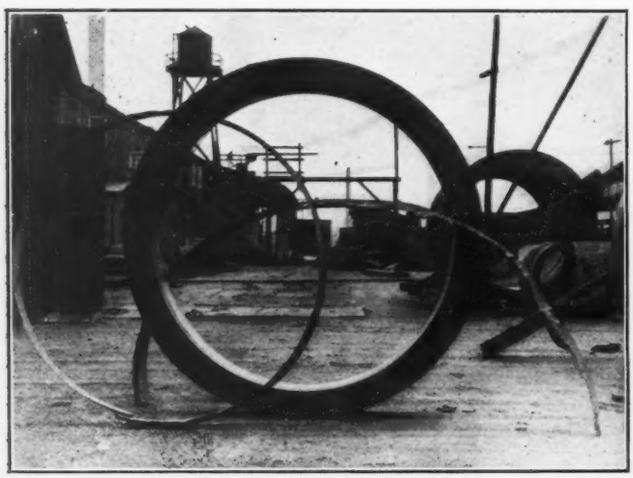


FIG. 1

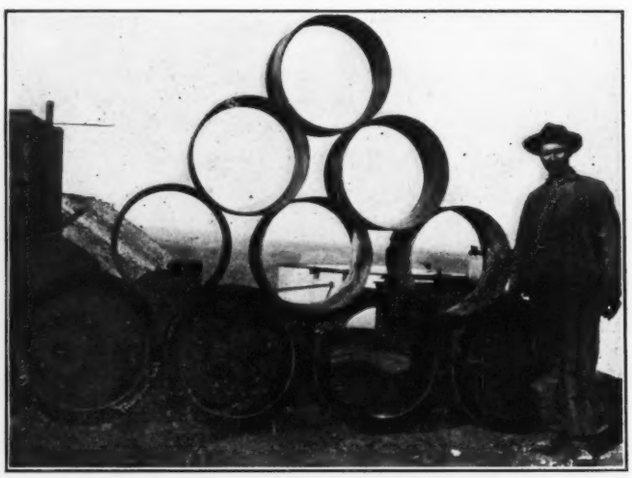


FIG. 2

CHILEAN MILL AND ROLL SHELLS

It is stated in San Francisco that the United States general land office has appointed a field mineral inspector for northern California, and especially for Shasta county. He is to examine into the character of lands claimed to be most valuable for agriculture or for timber, but which may be really mineral in character. Many complaints from California have been made on this subject, and the attempt is to be made to prevent the locating of mineral lands either for lumbering or agricultural purposes. The domain of the prospector has gradually been narrowed of late years, much mineral land having been acquired by locators of forest and agricultural claims.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

If practical, allow the lower worked-out parts of gaseous mines to fill with water as this prevents the generation of gases; the pressure of the water will confine them in the coal.

When a hoisting engine has been standing idle for an hour or so, an empty trip should be hoisted or lowered before raising or lowering men in order to see that the machinery is in perfect running order.

In a British colliery where all detonators were carefully tested by a galvanometer and strict supervision kept over their use, out of 43,161 shots fired during a period of 2½ years, only three shots missed fire.

If wood-lagged drums must be used, the lagging should be made of dry, hard, straight-grained wood. Maple has been found to give the best results as it is capable of withstanding the wear of the rope for a long time.

Laws governing ventilation and the proper handling of dust are most necessary and to be commended; but until ignorance, carelessness and greed for money can be legislated out of existence, mine accidents will continue to occur.

The well known coalfields of Alaska are about equal in area to those of Pennsylvania. Alaskan coal is mostly of inferior quality. It consists of three grades, semi-anthracite, bituminous and lignite, and ranges in age from Carboniferous to Eocene.

The use of steel tamping bars in coal mines should be prohibited for if they strike a sulphur ball when a hole is being charged, they sometimes make a spark which lights the powder and causes an explosion. All tamping bars should be copper-tipped.

It has been estimated that the employment of carefully trained firemen would save 10 per cent. of the fuel used in 50 per cent. of the plants in the United States; in 25 per cent. of the plants, 5 per cent. of the fuel might be saved by such skilled men.

When burning fine coal containing a large amount of sulphur, the clinkers which form are likely to adhere to the bars of the grate. This may be largely prevented by wetting the coal, by keeping water in the ash pit, or by introducing steam beneath the grates.

One of the greatest troubles experienced in the use of mechanical stokers is the habit many firemen have of poking the fires unnecessarily instead of using the attachments provided for handling the coal. It is also wasteful to shovel fresh coal into the stokers, instead of feeding the fire through the hopper.

Among the characteristics necessary in an ideal foreman are, broadness of mind; he should not be opinionated in regard to methods of work, machinery, or men; an ability to skilfully handle the men under him; promptness; self-control; firmness; perseverance; a knowledge of the proper amount of work to be done in a day; and a complete knowledge of all mining operations, methods and machinery.

One of the advantages gained by employing air-hammer drills is the use of less powder to the hole for blasting the rock. It is true, however, that more holes have to be drilled than where a piston drill is used, but the location of each hole is absolutely under the control of the driller, which is not the case with holes put down by a piston drill; in this latter case, the holes branch from a common center and so cannot all be in the best position for blasting.

All lines of shafting should be oiled at regular intervals. See that the oil does not drip or sling as this is wasteful and likely to injure the machinery. Splash-boards should be used to catch the oil that may be thrown from the rapidly moving parts of a machine and drip pans should be placed to catch all that falls from overhead bearings. The oil used between wearing surfaces should be caught, filtered and used again. After being used several times as a lubricant on bearing surfaces it can be used with advantage in bolt cutters and other similar machines.

The Durango coalfield, near Gallup, New Mexico, has an area of 13,500 square miles, 1900 square miles in Colorado and the remainder in New Mexico. The total tonnage of the field is estimated to be 80,000,000,000 short tons. The coal is bright and clean to handle, but when first mined, is hard and brittle, breaks easily, and produces a high percentage of fine coal. With the exception of the coal mined in the Durango district, this coal is of a non-coking character, therefore an excessive amount of fine coal is wasted. In some instances this waste amounts to as much as 20 per cent. of the run-of-mine output.

A new electro-barograph has been invented to furnish an automatic and audible signal in case of a sudden and dangerous drop of mine pressure. It consists of an aneroid barometer, fitted with three dry cells and a signal bell. The contact-maker may be adjusted at the beginning of each shift, or at any other appointed time. The distance between the pointer and the brush or contact-maker is adjusted to the requirements of each mine. As soon as the bar of the barometer falls a certain distance, measured by the interval between the pointer and the brush, electric contact takes place between the bar and the brush and the bell rings.

On motors used for hoisting, oil and a high grade of wool waste should be used on the bearings, as cotton and low-grade waste become soggy and do not maintain their position against the shaft. This waste should be thoroughly saturated with oil; it should be soaked at least 48 hours and then allowed to drain on a rack for 10 to 12 hours before it is used. If there is too much free oil, it is apt to work its way into the motor and damage it. A good grade of car-journal oil should be used. A heavier grade of oil is necessary for use in summer or on motors operated in warm places than for winter, or for work in a cool place, as the flow of oil is affected by the temperature of the surrounding atmosphere. Where grease is used as a bearing lubricant, the bearings require more attention than when oil is used.

Nothing better illustrates the importance of New York City as a coal consumer than the voracity of the furnaces of the downtown sky-scrapers. One building consumes 100 tons of coal a day, another between 75 and 100 tons, and still another 50 tons per day. The erection of a new sky-scraper of the average size means that at least 200 more carloads of coal must be brought into the city annually. The anthracite consumed annually in New York, including that for tugs and railroads within the city limits, amounts to 9,000,000 tons. This is more than one-eighth of the entire marketable output. The consumption of bituminous coal has been estimated at 6,500,000 tons a year. The strictly retail trade of the city amounts, at the least estimate, to 7,000,000 tons, or nearly 2,000,000 tons more than are sold at retail in the cold northwestern States of North Dakota, South Dakota, and Minnesota combined. The retail coal business of the city is greater than that of any State in the Union, except, of course, New York State. Of the total retail trade of the 10 largest cities, New York contributes more than one-third of the business.

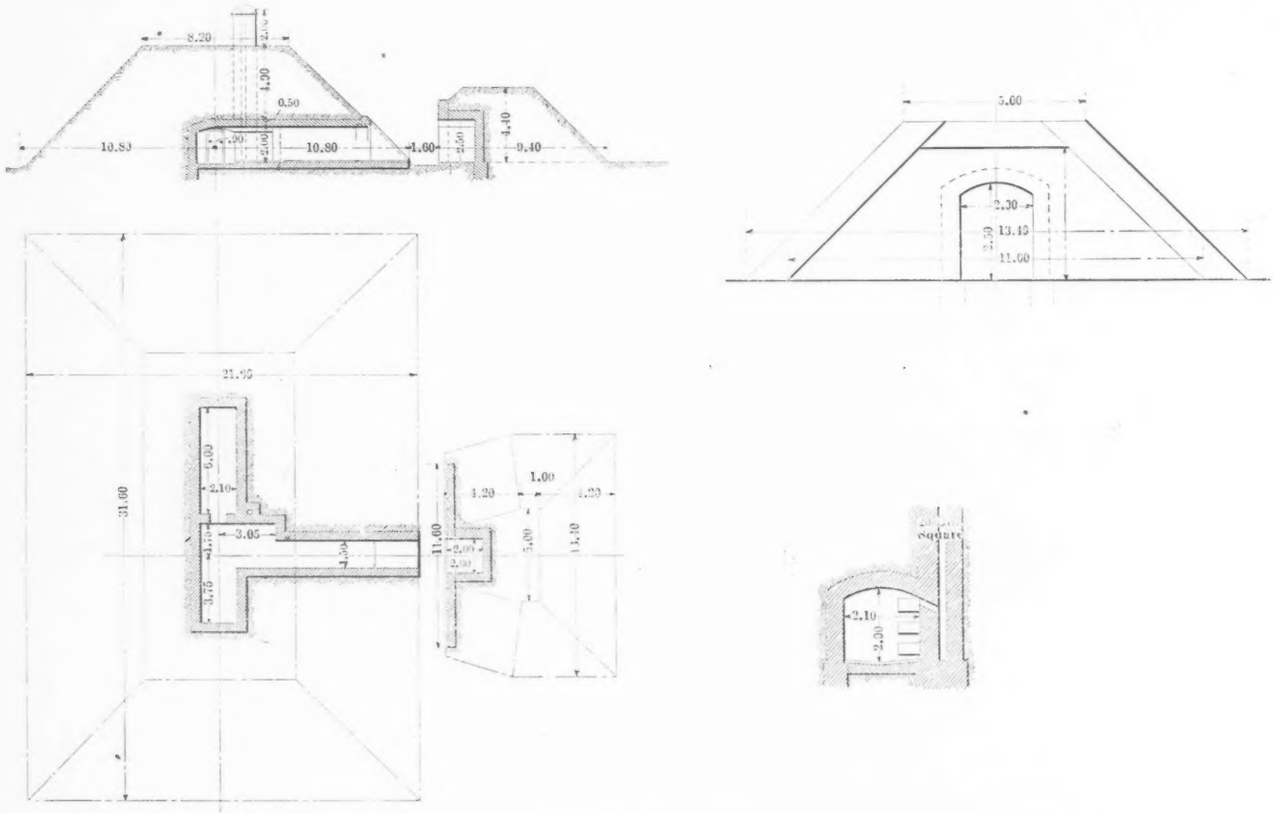
Dynamite Storehouse

In a recent bulletin of the Société de l'Industrie Minérale, Gaston Beuret describes a rather elaborate structure for the storage of explosives that was built in connection with shaft development at Sancy. Its design was fully approved by the administration of mines. It is separated by 150 m. from the nearest building.

The chamber was built of the best ashlar masonry, after the plan shown in the accompanying drawing, and was then covered at least 4 m. deep with screened earth, with all the small stones removed. Opposite the entrance was built a smaller pile of earth with a masonry niche designed to catch and render harmless any materials thrown out of the entrance passage in case of an explosion.

A chimney extends from the level of the chamber floor to a hight of 2 m. above the top of the dirt pile. The flue connecting the interior of the chamber with this chimney slopes downward so as to prevent the admission of any burning or inflammable substance into the chamber. The top of the chimney is further protected by a grating.

The outer entrance is closed by a firmly locked iron door, and the inner entrance to the storage chamber is closed by a locked wooden door. A barbed wire and picket fence surrounds the magazine at a distance of 50 m. The doors are connected electrically with an alarm in the mine office, in such manner that the opening of either door, or the cutting of the electric wire, will give a signal. The storage chamber was designed to hold 200 kg. of dynamite, which obviated too frequent handling in the winter.



DYNAMITE STOREHOUSE
Dimensions are in meters.

Assay of Battery Chips and Screens

Battery chips are usually sold at a fixed price per ton irrespective of their fixed value. As, however, the gold adhering to the iron often amounts to several ounces per ton, a good assay method is of great assistance in determining the proper value of such chips. The chips are usually received for assay in the form of fine filings or broken fragments up to half an inch in diameter. L. J. Wilmoth[1] recommends a direct fire assay in preference to dissolving the iron in acid and assaying the residue, which is a slow and expensive method.

The fire assay converts the iron into a matte while the gold is collected as usual in a button of lead. None of the gold is carried in the matte, but if silver is also to be determined, the matte must be treated by the usual methods. The following charge is found by Wilmoth to give good results: Battery chips 1 a.t., sodium carbonate 1.5 a.t., fused borax 1.5 a.t., sulphur 0.5 a.t., silica 0.5 a.t., lithage 1.0 a.t., and charcoal one gram. An iron nail should be added to the charge. The silica is added to protect the crucible.

After quick fusion the charge is given a wash down with a small quantity of litharge and charcoal. In this assay the furnace must be run at a slightly higher heat than is usual for a gold assay. The crucible must also be allowed to remain in the furnace fully 20 minutes after quiet fusion. If the heat be insufficient or the charge be poured too soon, the iron will be found in small lumps on top of the lead button and not completely absorbed into the matte, the assay being thus rendered useless.

The battery screen samples come into the assay office in the form of small clippings. They may be assayed in the same way as the battery chips, but it is better to roast them about an hour in a muffle as the resulting oxide can be readily pulverized. The oxidized matter thus obtained may be assayed as an iron ore. Or it may be converted into a regulus by the addition of sulphur. In converting it into a regulus the following charge is recommended: Iron oxides, sodium carbonate and litharge, 1 a.t., each; silica; fused borax and sulphur 0.5 a.t., each; charcoal one gram and an iron nail.

[1] *Journal* of the Chemical and Metallurgical Society of South Africa, Feb., 1908; p. 230.

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*Illustrated.

The Chinese in the Transvaal

The Chinese experiment in the Transvaal is approaching its end. The men who were brought from China under contract are being sent back as fast as their terms expire, and this element of mine labor will practically disappear by the end of next year. At the end of May the number remaining was 22,667, out of nearly 60,000 at one time employed in the mines. Although there was a heated discussion before the law providing for their exclusion was passed, the process of deporting them has been carried on quietly, and with little disturbance to the work of the mines, as is shown by their continued large production.

Concerning their employment there have been widely differing opinions. The more general seems to be that they made fair miners, but they required close supervision. The Chinaman is a hard worker on his own account, but he is an adept at shirking when he can do it without loss to himself. Under the peculiar conditions obtaining in the Transvaal, where a very large proportion of hand labor is used, and where that labor must be low priced to enable the mines to earn a profit, the Chinese served a purpose and tided over a period when negro labor was scarce, owing to a variety of causes. They kept up the average work at the mines, and prevented a serious fall in gold production. Whether it is really desirable to keep them as a permanent element in the Witwatersrand, is a point on which the opinions of mine managers are said to vary widely, though many of them are cautious about expressing their views. At any rate, it was not their efficiency as miners or mine laborers that determined their exclusion. The law was passed on the ground that the inclusion of this new element in South Africa—already confronted with the problem of managing a negro population largely exceeding the whites in numbers—was wholly undesirable from a political and economic point of view. For that belief there seems to have been substantial grounds, and locally these were accentuated by the difficulties found in dealing with the criminals included in the Chinese importation. The proportion of these was small, but enough to make trouble, which was kept as quiet as possible, and but little discussed publicly.

The mines have been fortunate in being able to secure an increased supply of negro labor as the Chinese were eliminated. The cessation of railroad and public works, the occurrence of two seasons unfavorable to agriculture and cattle-raising, and the extension of recruiting into the Portuguese territory brought about a large increase in the number of Kafirs willing to work in the mines. At the end of May there were 130,000 employed on the Rand, and the number was gradually increasing. The full operation of mines and mills and the large production of recent months furnish evidence that the present supply of low-priced labor is at least sufficient.

The problem of unemployed white labor, which is at present vexing the Transvaal, is another matter altogether. White labor and the extended use of machine drills are the remedy suggested, but apparently not favored by the mine-owners who consider low-priced labor essential to their prosperity. But this is properly a separate discussion. The Chinese question is decided, and it looks as if the decision will prove to be a wise one in the long run, from many points of view.

Prices and Movement of Silver

The price of silver, which began to decline in October last, reached a low point early in this year, from which there has been only a slight recovery. For the five months ended with May, the average price in New York was 54.869c. per ounce this year, as compared with 67.294c. in 1907. The lowest monthly average this year was 52.795c., New York, in May, which compares with 65.981c. in May, 1907. The lowest daily quotation reached was 52c. in New York and 24d. in London, on May 6. From that point there has been a slight advance, but not at all a marked one.

The cause of the fall and continued low price was not the same as in the case of the metals of construction, though the depressed financial condition undoubtedly has had a reflex effect on the silver market. The fall began last October, the direct cause being the failure of the rains over a large part of India, forerunner of short crops and diminished purchasing power in that country. As in previous years, the Far East has been the determining factor in the silver market. Other causes have contributed to the fall in a less degree. The demand for silver for use in the arts has been much lighter than

last year, decreasing, as it always does, in times of financial disturbance. France and the other countries in the Latin Union have been light buyers for coinage so far this year. The United States Mint, while it has not been a buyer since April, has taken almost exactly the same quantity this year as last for the five months—4,978,300 oz. in 1907, and 4,967,000 oz. this year.

For the shipments to the East we have to go to London, which is still the great market where the silver trade is handled. For the five months to the end of May the shipments to India were £5,445,244—approximately 41,975,000 oz.—in 1907, and £3,584,018—approximately 33,950,000 oz.—in 1908; a decrease of 34.2 per cent. in value, and 19.2 per cent. in quantity. China took some silver early in the year, but has bought none for several months, and is now offering some quantities for sale.

Market supplies have not been lacking, while the demand was falling off. The United States furnishes four-fifths of the supplies sold in London, and its total exports for the five months were $23,858,610—or about 35,450,000 oz.—in 1907, and $21,077,885—or about 38,415,000 oz.—this year, a decrease of 11.2 per cent. in value, but an increase of 8.3 per cent. in quantity; the difference being due to the lower prices this year. Other supplies from producing countries show small changes. Australia, which is the only important shipper to the Far East outside of London, had a large silver production in 1907, and has probably kept it up this year; but no statistics are available.

The latest reports from India are more favorable, and indicate better crops for the current season, with some revival of purchasing power for the Indian buyers. This promises some advance in prices, but it will probably be slow. It is the purchase and holding of silver by individual buyers in India which takes up the surplus metal of the world, and in the end regulates the price of silver in the world's market.

Enjoining Gold Dredging in California

The formal legal proceedings to enjoin gold dredging in California have been begun. These proceedings are instigated by the same interests which succeeded in practically stopping hydraulic mining in the State, and for the same reasons—the claim that those operations injure some agricultural lands and interfere with navigation of some of the rivers of the State. The present suit is regarded as a test case, and is brought in the name of the county of Sutter, to enjoin the Pennsylvania Gold Dredging Company from working its dredges at Oroville, on the ground that the tailings are deposited in Feather river, and are liable to obstruct navigation in the rivers to which that stream is tributary. The movement appears to be supported by the forming interest, even in Butte county, where the largest dredging operations are carried on, and where they constitute an important contribution to the industrial activities of the county.

The dredge-owners are prosperous, for the most part, and are well supplied with money; so that the present suit, as a test case, will probably be stubbornly contested in the courts.

Iron Ore Resources of Canada

In view of the fact that iron-ore reserves in the United States are practically controlled by the Steel Corporation and a few other large companies, the question of Canadian iron-ore supply is of considerable importance to this country, as well as to the growing industries of Canada. At present the iron-ore production of the Dominion is not large, outside of Nova Scotia, but the unworked and partly unexplored reserves are believed to present many possibilities for the future.

In the Lake Superior region the results of exploration on the Canadian side of the line have hardly come up to expectations. The Michipicoten range has developed only one good mine—the Helen, which supplies the blast furnaces at the Sault Ste. Marie. Explorations on the Atikokan are still being carried on, but they are mainly in the Steel Corporation interest, and the results obtained—if any—have not been made public. On the southeastern end of this district, however, a promising iron mine has been opened, the ore from which will be used in the new blast furnace at Port Arthur, owned by the Mackenzie-Mann interests. A little further east, in the Moose Mountain range, not far from Sudbury, a large mine is being opened, from which ore can be shipped over an 80-mile railroad to Lake vessels on Georgian Bay, or over the Canadian Pacific and the Canadian Northern roads. The Moose Mountain mine is controlled by parties in the United States, though the Mackenzie-Mann combination is said to have an interest. In the Nipigon lake area and other sections of northern Ontario, nothing of importance has been found as yet, though there is enough to warrant further search for workable areas.

In Quebec it appears quite probable that good deposits of workable iron ore exist in the north country, which will be opened by the building of the eastern division of the new Transcontinental railroad. Mr. Obalski, the chief of the Mining Bureau, believes strongly in the possibilities of the extensive areas of iron sand on the north shore of the lower St. Lawrence. The main point to be determined is the possibility of concentrating and agglomerating this finely divided material on a commercial scale, to fit it for use in the blast furnace.

The resources of Nova Scotia are well known. At present the mines worked do not do more than supply local needs. Hardly that, indeed, for the Dominion Steel Company has had to go to Newfoundland for part of the ore required for its blast furnaces at Sydney.

The Mines Department of the Dominion has begun a systematic investigation of the iron-ore resources, which will undoubtedly add much to our knowledge of their extent and future possibilities. This work will be of much value in pointing out the more promising fields for future explorations.

The Transvaal gold production for May was $12,029,775, the largest monthly return ever made, with the exception of December, 1907, when the figures were swelled by the inclusion of gold reserved from previous months. For the five months ended May 31 the total was $58,392,420, an increase of 7.4 per cent. over last year. This increase was made, notwithstanding the continued deportation of Chinese laborers, which, it was predicted, would largely cut down the production. The place of the departing coolies, however, has been more than filled by the influx of Kafirs, as is shown by the results.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

The Market Price and Gold Production

One of our foremost "captains of industry" in a speech before the convention of Governors recently held in Washington made the statement that, "The production of gold is controlled wholly by the market price." That this is not so is patent to all miners. The production of gold is governed rather by chance discovery and by the improvements in the art of mining and extracting the precious metal.

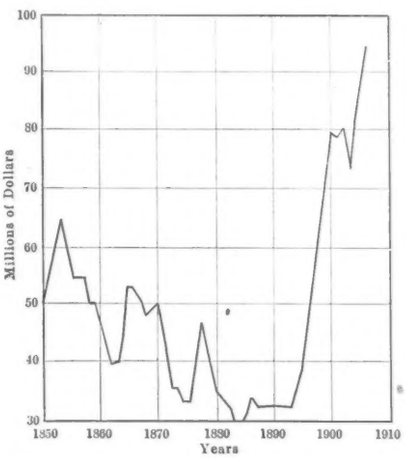
The market price of gold had nothing to do with the forty-five hundred odd millions obtained by means of slave and contract labor during the last 100 years, nor the thousand millions obtained by conquest and the nine thousand millions secured by means of slavery since the time of the discovery of America to the present time, nor that produced by other means; for it has been shown by many authorities that taking into consideration all outlay gold has in late years been produced at a loss. While the mines that pay dividends are exceptional, those that produce gold at a loss are plentiful. The extraordinarily rich deposits of gold that have at various times been found is the great inducement to gold miners, and the market price which is the mint price and which is $20.67 per oz. had nothing to do with their activity.

The market for gold has been unrestricted since the mints of the western world were thrown open to the free coinage of gold. The price of gold is fixed because the mint offers $20.67 per oz. for it. Here we have a substance for which there is a constant demand both in the arts and in the coinage systems of the various countries of the world. This fixed price for gold is due to law and to that alone.

The stock of gold on hand and in public depositories of the world is roughly five or six billions of dollars. The annual production is about four hundred millions (of which a part is consumed in the arts) but the annual addition to the stock of currency has but little effect on the prices of commodities; and indeed the increase in the supply is hardy keeping pace with the world's requirements.

Causes of Increased Production

The improvements in the art of mining and in the reduction of ores have been the principal cause of the increased production of late years. Without the cyanide process gold mining in South Africa would not have been possible, and the hundred millions or more per annum from that source would not have been forthcoming. There are other conditions worthy of attention. It is not prudent to put the unskilled and uneducated miner or the business man unaccustomed to mining in charge of mining operations. The class of mines that such men could work at a profit were first to be worked out. The gravel or quartz deposits were rich and required less technical knowledge for the extraction than now. The engineer must now handle ores that under the best conditions may return but small profit per ton and only skilled and trained operators can hope to carry out such undertakings successfully. Very often a large outlay



PRODUCTION OF GOLD IN THE UNITED STATES SINCE 1850

is required before a pound of ore can be crushed or washed by machinery. The capacity of the plant, the character of the machinery and the processes both for mining and winning the gold are subjects for expert consideration.

While the axiom, "The sooner the mine is exhausted the greater the profits," may hold good, yet in practice the size of the plant must be determined by the amount of capital available at the time, the geological conditions and the size of vein and the ease or difficulty of keeping up reserves. Over-valuation with the great proportion of the shares in the hands of the promoters is the curse of mining; but in this respect times are changing for the better. The indications point to a saner method of mine finance by employing more competent mining advisers. When all mining is conducted on business lines with men in control of the operations whose business is mining, we may expect to see a great increase in the profit.

Fluctuations of Values

The variation in the price of other metals found in countries where gold mining is conducted influences the production of gold. When the values of these metals fall the men flood the local mining market and immediately go prospecting on their own account for gold. We can see the effects of conditions of this kind in the last year. Many copper mines in the western States were forced to suspend operation when the price of copper dropped; mines which started operations when the price of copper was high were forced to shut down and this threw many men out of work. What was more natural than that these men should gravitate to the adjacent gold-mining States for employment and prospect in hopes of finding rich placers or quartz mines? The result is that many new districts were discovered which in time will turn out millions of dollars worth of gold.

The so-called appreciation of gold had nothing to do with these discoveries, but the depreciation of other metals indirectly led to them. The price of gold is fixed by law. The amount of commodities that an ounce of gold will buy when converted into money does not at all influence the production of gold. The miner pays a dollar a day for his board whether sugar is 5c. or 10c. per lb. In fact the labor unions have a much greater influence on the production of gold than have prices of commodities. Algernon Del Mar.

New York, June 4, 1908.

[Mr. Del Mar writes about a subject concerning which there is a great diversity of opinion. In regard to the notion, now prevalent, that recent high prices have been due to a depreciation in the value of gold, the Journal has repeatedly expressed its doubt that there has been any depreciation. The position of gold in the world's markets is a matter of great importance to which we shall refer at length in future issues of the Journal.—Editor.]

Brangle Ore

In the Journal of June 13 there is an inquiry from a correspondent as to the definition of "brangle ore" in the Wisconsin zinc district. In your reply you state it is a common British mining term that is equivalent to saying "speckled with ore." While this might be interpreted

as being equivalent to our common American term "disseminated ore," I beg to state that in the Wisconsin region, which has a number of local innovations, the term brangle ore is applied to a type quite different from that known there as disseminated ore.

In Wisconsin the term "brangle ground" is applied to the upper, highly leached portion of the Galena limestone that is in a more or less cavernous or highly honeycombed condition through the leaching of atmospheric waters. While the cavities are not large, they are very numerous and are the type frequently found in the Trenton limestone, and which has been not inappropriately named "petrified wasp-nests." When such cellular limestone has the small cavities or cells more or less filled by lead or zinc, it is known as brangle ore.

In the deeper ground in the Wisconsin district below the permanent water level, the disseminated ore also occurs, usually a metasomatic replacement and similar in type to the disseminated ores of southeast Missouri. There is, therefore, a very marked difference in the brangle and disseminated ores in Wisconsin, since the former are in the soft, highly porous limestone that is usually only slightly refilled by lead or zinc ore, while the typical disseminated ore is in hard ground that is solid and in which the ore is a molecular replacement.

There is a significant reason for making this apparently trivial distinction. Thus far the brangle deposits have not proved to be very large or persistent orebodies, although often very rich; in some of the pipe veins of the Dubuque district the brangle ores yielded 30 to 40 per cent. jack, or zinc blende. The disseminated type of orebodies are usually much more persistent and reliable for they occur in the "core" or footwall of the flat and pitch types of deposits. They vary considerably in grade; some of the large pitches and flats yield only 5 to 10 per cent. jack, while the disseminated orebody in the upper level of the Baxter mine yielded from 30 to 35 per cent. jack.

Runs of ore shoots of the brangle type sometimes change in depth into the more persistent flat and pitch type of ore deposit, as in the Enterprise mine, at Platteville, and the Mills mine, at Hazel Green.

H. A. WHEELER.

St. Louis, Mo., June 15, 1908.

Consul Thomas H. Norton, writing from Chemnitz, states that one of the oldest and best known silver mines in Europe, that of Freiberg, in Saxony, is soon to be permanently closed after a long continued and practically uninterrupted period of exploitation, dating back to 1163.

Peat for use as a steam fuel is obtainable as cut peat, machine peat, briquetted peat, and dust peat, or peat powder.

Assay of Gold Telluride Ore

G. Borrowman (*Journ.* Am. Chem. Soc., XXX, pp. 1023-1027) has made some investigations on the losses in assaying telluride gold ores. The ore selected for the investigation contained 10.5 per cent. tellurium, chiefly as hessite and sylvanite. The ore was silicious and had a reducing power of about 1.5. To obtain as uniform a sample as possible, the ore was ground to pass a 120-mesh sieve, then further ground in agate until it all passed through bolting-cloth. Portions of 0.1 a.t. were taken for assay, being weighed on a quantitative balance. The fusions were made in a muffle at a temperature of about 1200 deg. C.; the fluxes were passed through a 40-mesh screen and mixed with the ore until thoroughly homogeneous.

To investigate the fusion slag loss due to tellurium, series Nos. 1 and 2 were run. In the series No. 2 the charge was: Ore 0.1 a.t.; flux in grams, litharge 90; silica 10; argols 2.5; sodium bicarbonate 30; salt cover. The tellurium was removed from the sample in series No. 1 by boiling with nitric acid (1.27); the residue was washed, dried and fluxed as in series No. 2, and inquarted with silver. The slags from each series were ground and assayed, using litharge, 30 grams; argols 2 grams; salt cover. The buttons from both the slags and ores were cupelled.

GOLD IN FUSION SLAGS.

	Series No. 1.		Series No. 2.	
	Ore.		Ore.	
No.	Gold, Oz. per Ton.	Slag. Gold.	Gold, Oz. per Ton.	Slag. Gold.
1	161.4	None.	161.0	Trace.
2	161.8	None.	161.6	None.
3	161.8	None.	162.0	Trace.
4	162.3	None.	161.0	None.
Aver.	161.8		161.4	

The effect of tellurium is evidently negligible as regards the gold loss in slag.

Series No. 3 was run to determine the effect of tellurium in cupellation and the oxidizing effect of litharge on the tellurium in the crucible charge. The samples were run in duplicate; one of the lead buttons from each set was analyzed for tellurium and the other button cupelled and parted.

EFFECT OF TELLURIUM IN CUPELLATION
(Series No. 3).

No.	Grams. PbO in Charge.	Milligrams. Te in Button.	Gold, Oz. per Ton.
1	90	Lost	161.0
2	120	287.5	162.4
3	150	298.9	161.8
4	180	176.8	161.5
Average			161.7

RESULTS

The different amounts of litharge make but little difference in slagging the tellurium. A duplicate silver bead from No. 1 of this series contained 6.9 milligrams of tellurium, and even with this amount present there is a negligible loss of gold.

The last series, No. 4, was run to learn the effect of variation of temperature of fusion on gold recovered, and the amount of tellurium carried into the lead button. The work was run in duplicate, one lead button being run for tellurium, and the other for gold:

SERIES NO. 4.

No.	Temperature. Deg. C.	Weight of Buttons.	Gold. Oz. per Ton.	Te Milligrams.
1	800	30.5	161.0	258.2
2	1000	32.5	161.6	150.0
3	1250	32.8	162.0	195.6
4	1600	32.8	161.6	215.9
			161.6	

The temperature seems to have little effect on the gold recovery or the amount of tellurium in the lead button.

It is evident that the irregularities attributed to tellurium are overdrawn, and the presence of tellurium in the silver bead does not necessarily imply a gold loss in cupellation, although, of course, it is not permissible in silver work. In silver work the author recommends a preliminary treatment with nitric acid, with a subsequent precipitation of the silver as chloride, which may be dried and added to the gold residue for the crucible fusion. The author believes that some of the previously reported differences in assaying telluride ores are more likely to have been due to lack of homogeneity of the sample than to the presence of tellurium.

Sault Canal Traffic

The report of traffic through the Sault Ste. Marie canals form the opening of navigation to June 1 shows a remarkable falling off, the total freight moved having been in short tons:

	1907.	1908.	Changes.
East-bound	6,615,479	1,049,313	D. 5,566,166
West-bound	2,307,398	618,829	D. 1,688,569
Total	8,922,879	1,668,142	D. 7,254,735

The number of vessels passing this year was 1343, showing an average cargo of 1242 tons. The mineral freights included above were, in short tons:

	1907.	1908.	Changes.
Coal	2,092,278	453,149	D. 1,639,129
Iron ore	5,496,767	263,882	D. 5,232,885
Pig and manuf. iron	52,301	50,820	D. 1,481
Copper	14,872	14,264	D. 608
Salt, in bbl	113,206	163,534	I. 50,328

The decrease in coal this year was 78.3 per cent., and in iron ore 95.2 per cent.

Imports of sulphur from Sicily into the United States have decreased from 83,201 tons in 1905 to 20,299 tons in 1907. The exports of Louisiana sulphur were 14,437 tons in 1907; there was none exported in 1905.

A New-Old Copper District in California

SPECIAL CORRESPONDENCE

The Low Divide copper mines in Del Norte county, Cal., are now being operated after over 40 years idleness, and shipments of ore are about to begin. The ore will be hauled from the mines to Smith river bridge, then taken in cars to Crescent City and thence shipped by sea to the smelters on San Francisco bay. These mines were worked in the early "sixties" and the ore was shipped to Swansea, Wales, at a cost of about $30 per ton. The unfavorable economic conditions finally closed the mines down. Most of the copper deposits in this county lie along its northern border, on the northern tributaries of Smith river. There are three districts on the belt, the oldest one being the Low Divide. It is not unusual for the ores to carry 30 per cent. copper, but the deposits thus far worked have been limited in extent and generally irregular, consisting of a series of bunches or lenses of ore arranged along a zone which is itself only vaguely definable. The ore, however, is often of high grade, consisting of copper glance, black and red oxides, carbonates and native copper. The cost of shipping ore from Crescent City to San Francisco is $5 to $6 per ton, to which must be added the cost of bringing the ore from the mines to Crescent City.

Robert Hallowell Richards

On the evening of Saturday, June 6, there was held at the University Club, Boston, a dinner in honor of Prof. Robert H. Richards upon the completion of 40 years' continuous teaching at the Massachusetts Institute of Technology. About 40 were present at the dinner, and speeches in praise of Professor Richards' work as a teacher, as an organizer of the course in mining engineering and metallurgy, as a perfecter of metallurgical processes, as secretary of the faculty, as first president of the alumni association, and, above all, as a man, were made by Mr. Munroe, '82, who presided, by Dr. Noyes, '86, acting president of the institute, by Professor Niles, by Colonel Livermore, Mr. Fish, and Hon. Eben S. Stevens, '68, of the corporation, and by Professor Hofman, of the Department of Mining and Metallurgy. In the course of the evening, extracts were read from a number of the letters and telegrams which had been received, all of them unanimous in their expression of praise and affection. After the reading of these extracts James P. Tolman, '68, on behalf of the many donors, presented to Professor Richards a hand-wrought silver bowl, made by Mr. Forssen, of the Society of Arts and Crafts, and inscribed around the rim, in Roman letters: ROBERT HALLOWELL RICHARDS—MASSACHUSETTS INSTITUTE OF TECHNOLOGY—JUNE, MCMVIII—FORTY YEARS IN THE SERVICE. In response to this gift Dr. Richards (for he had just returned from receiving the degree of LL.D. from the University of Missouri) responded in a characteristically modest speech, which was received with great favor.

The U. S. Geological Survey

The work of the U. S. Geological Survey is carried on by means of appropriations made each year by Congress, chiefly in the act providing for "sundry civil expenses of the Government" and pupularly known as the sundry civil bill. For the coming fiscal year—1908-09—this act appropriated for the Survey $1,335,520, specifying that the sum be applied to the following purposes:

Geologic surveys	$200,000
Paleontologic researches	10,000
Chemical and physical researches	20,000
Mineral Resources report	75,000
Topographic surveys	300,000
Forest-reserve topographic surveys	75,000
Water-resources investigations	100,000
Structural-materials investigations	100,000
Fuel-testing investigations	250,000
Geologic maps, printing and engraving	100,000
Illustrations for reports	18,280
Books for library	2,000
Statutory and temporary salaries	85,240
	$1,335,520

An appropriation of $80,000 for the investigation of Alaskan mineral resources by the Geological Survey was carried in the deficiency bill, passed early in the spring.

An appropriation of $157,350, to be expended under the direction of the Secretary of the Interior, was also made in the legislative act for coal-mine inspection in the Territories and for investigating the cause of mining accidents, and the work has been intrusted to the Survey.

Other appropriations, for rent of offices in Washington and for the publications, make the total for the work of the Survey exceed one and three-quarter million dollars.

American Institute of Chemical Engineers

This new technical society was organized at the Engineers' Club, Philadelphia, Monday, June 22. About 20 were present at the meeting; the society will begin with a membership of about 80, which it is expected will increase rapidly. The following officers were elected to serve for the current year: President, S. S. Sadtler, of Philadelphia; first vice-president, C. F. McKenna, of New York; second vice-president, H. A. Hunicke, of St. Louis; third vice-president, E. G. Acheson, of Niagara Falls; secretary, J. C. Olsen, of Brooklyn; treasurer, W. M. Booth, of Syracuse; auditor, R. K. Meade, of Nazareth, Penn. These, together with nine directors, constitute the council, or governing body, of the institute.

Membership in the institute is limited to chemical engineers who must be at least 30 years of age and must have had at least 10 years of practical experience, but graduates of technical schools and universities approved by the council, are qualified by six years of practical experience and holders of a doctor's degree are, moreover, credited with the time spent in preparation for that special degree. The annual dues are $15. When the membership has reached 200, there is to be an initiation fee of $15 to be paid by candidates thereafter admitted to membership.

The purpose of the society is to promote the advancement of the profession of chemical engineering, the maintenance of high professional standards, and the increase in technical knowledge through the publication of papers and discussions all of which are highly commendable objects.

A Smelter Smoke Test

SPECIAL CORRESPONDENCE

There was an interesting test recently applied in the controversy between the smelter people and the residents around San Francisco bay in California. The managers of the Selby Smelting Company claim that Benicia suffers as much from the fumes from the oil and powder works down the bay as from the smelter, and in order to prove this, by giving the people a chance to smell the other fumes, closed down the smelter a few days, during which as much complaint as ever was made about the fumes. For this reason the company does not wish to be held entirely responsible for the objectionable condition of affairs. The Benicia people will, in their litigation, now have to bring more conclusive evidence than heretofore as to the smelter fumes being a nuisance.

In a report on the mineral resources of the Dominican Republic the British vice-consul at Santo Domingo writes that the petroleum belt measures over 190 square miles. The oil is found in great abundance in the province of Azua, and the fields are said to extend from a point near the town of Azua for many miles into the interior. At present this deposit is under exploitation by an American company, known as the West Indian Petroleum Mining Company. The first well sunk threw out a column of oil over 70 ft. high. It seems probable that the entire belt extends from Azua, on the southern coast, to Puerto Plata and Monte Cristi, on the northern coast.

Silicon-copper is used in bronzes to eliminate the oxides formed in casting.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

ALUMINUM OXIDE—Process for the Production of Aluminum Oxide. Frank W. Morris, Victoria, British Columbia, Canada. (U. S. No 890,084; June 9, 1908.)

REDUCTION—Process of Winning Aluminum or Other Metals From Their Compounds. Henry S. Blackmore, Mount Vernon, N. Y. (U. S. No. 889,098; May 26, 1908.)

ANTIMONY

RECOVERY—Wet Process of Recovering Antimony in a Pure State from Ores, Concentrates, Tailings and Slimes Containing It. John R. Masson, Wandong, Victoria, Australia. (U. S. No. 890,432; June 9, 1908.)

IRON AND STEEL

BRIQUETTING—Method of Dephosphorizing and Reducing Iron Ore. John T. Jones, Iron Mountain, Mich., assignor of one-half to George A. St. Clair, Duluth, Minn. (U. S. No. 890,233; June 9, 1908.)

CHARGING DEVICE for Blast-Furnaces. Arthur G. McKee, Cleveland, Ohio, assignor of one-fourth to Frank K. Hoover and one-fourth to Arthur J. Mason, Chicago, Ill. (U. S. No. 890,569; June 9, 1908.)

DEPHOSPHORIZING—Method of Dephosphorizing Ores. John T. Jones, Iron Mountain, Mich., assignor of one-half to George A. St. Clair, Duluth, Minn. (U. S. No. 890,230; June 9, 1908.)

BLAST-FURNACE-CHARGING APPARATUS. David I. Miller, Sheffield, Ala. (U. S. No. 887,723; May 26, 1908.)

ORE-SMELTING FURNACE. John T. Jones, Iron Mountain, Mich., assignor of one-half to George A. St. Calir, Duluth, Minn. (U. S. No. 890,232; June 9, 1908.)

ORE-REDUCING FURNACE. John T. Jones, Iron Mountain, Mich., assignor of one-half to George A. St. Clair, Duluth, Minn. (U. S. No. 890,229; June 9, 1908.)

ORE TREATMENT—Method of Treating Ore. John T. Jones, Iron Mountain, Mich., assignor of one-half to George A. St. Clair, Duluth, Minn. (U. S. No. 890,231; June 9, 1908.)

ORE TREATMENT—Method of Treating Iron Ores. John T. Jones, Iron Mountain, Mich., assignor of one-half to George A. St. Clair, Duluth, Minn. (U. S. No 890,234; June 9, 1908.)

SLAG UTILIZATION—Improvements in Treating Slags, from Steel- and Iron-making Processes and Utilizing the Products Thereof. Tomas Twynam, Wynyard House, Coatham Road, Redcar, Yorkshire, Eng. (Brit. No. 9073 of 1907.)

COAL AND COKE

FORMALDEHYDE—A New Fuel (Formaldehyde) for Industrial Purposes. Felix Clauss, Berlin, Germany. (Brit. No. 21,360 of 1907.)

PEAT—Improvements in Processes of Preparing Peat. Charles Ulmer Greeley, Bangor, State of Maine, U. S. A. (Brit. No. 9911 of 1907.)

TREATMENT OF COAL—Improved Treatment of Coal for Fuel and Gas Manufacture. James Jowett, Chestnut Cottage, Bolton-le-Sands, Lancashire, Eng. (Brit. No. 14,893 of 1907.)

COPPER

HYDROMETALLURGY—Liquors resulting from wet copper process are treated with ordinary calcium carbonate in quantity approximately equal to the amount of iron contained in the liquor. Air is then blown through the mass and practically all the iron is deposited, leaving the zinc to be precipitated by the action of the lime, or as zinc-white. Josiah W. Knaston and the United Alkali Company, Ltd., Liverpool, Eng. (Brit. No. 12,575 of 1907.)

ORE TREATMENT—Method of Treating Copper Ores. John T. Jones, Iron Mountain, Mich., assignor of one-half to George A. St. Clair, Duluth, Minn. (U. S. No. 890,563; June 9, 1908.)

GOLD AND SILVER

AMALGAMATOR. Emillous C. Ziegler, Centralia, Wash. (U. S. No. 890,010; June 9, 1908.)

AMALGAMATOR. Willis C. Bourdette, Gunnison, Colo. (U. S. No. 889,099; May 26, 1908.)

CONCENTRATOR or Washer for Precious Metals. Oliver H. Wade, Boston, Mass., assignor of one-third to Peter P. Porter, Boston, Mass. (U. S. No. 889,864; June 2, 1908.)

CYANIDATION—Apparatus for Treating Liquids. Wilbur A. Hendryx, Denver, Colo. (U. S. No. 899,130; May 26, 1908.)

CYANIDATION—Filtering and Decanting Apparatus. Wilbur A. Hendryx, Denver, Colo. (U. S. No. 889,131; May 26, 1908.)

FILTER. Edwin Burt, El Oro, Mexico. (U. S. No. 12,807; June 9, 1908.)

GOLD-SAVING APPARATUS. Louis Sachse, Los Angeles, Cal. (U. S. No. 889,-813; June 2, 1908.)

GOLD-SAVING MACHINE. Thomas Hussey, Hollywood, Cal. (U. S. No 890,059; June 9, 1908.)

MICA

SHEET MICA—Machine for Folding Sheets of Mica. Edward Cooper, Newton, Mass, assignor to American Mica Company, Newton, Mass., a Corporation of Massachusetts. (U. S. No. 890,500; June 9. 1908.)

RARE METALS

EXTRACTION — Process of Extracting Uranium and Vanadium From Ores. Herman Fleck and William G. Haldane, Golden, and Edwin L. Waite, Denver, Colo. (U. S. No. 890,584; June 9, 1908.)

TIN

ELECTROLYTIC PROCESS—Process of Obtaining Pure Tin From Crude Tin or Tin Alloys Electrolytically. Otto Steiner, Crefeld, Germany. (U. S. No. 890,249; June 9, 1908.)

MINING—GENERAL

FUSES—Improvements in Blasting and Mining Fuses. (An arrangement to make the fuse act as a detonating one or a slow one, at will). Jean Harle, Rouen, France. (Brit. No. 1820 of 1908.)

RAIL—Flexible composite rail for portable railways, primarily intended for use in mines. Alfred Edwin Davis, Richard Meyer, Francis H. Medhurst and J. E. Farrar, Johannesburg, So. Africa. (Brit. No. 10,732 of 1907.)

METALLURGICAL MACHINERY AND APPARATUS

BLOWPIPES FOR SOLDERING, ETC.—Improvements in Blowpipes for the Autogenous Soldering, Melting and Cutting of Metals. Paul Dumesnil, Paris, France. (Brit. No. 14,366 of 1907.)

ELECTRIC FURNACE. Paul Girod, Ugine, France. (U. S. No. 885,745; April 28, 1908.)

ELECTRIC FURNACE. Albert J. Peterson, Alby, Sweden. (U. S. No. 889,857; June 2, 1908.)

ELECTRIC FURNACE Provided with an External Casing of Iron Plates which Forms Part of the Body of the Electro-Magnetic Blowing Contrivance. Emilien Alphonse Omer Viel, Paris. (Brit. No. 24,807 of 1907.)

ELECTRIC INDUCTION-FURNACE. Karl A. F. Hlorth, Christiania, Norway. (U. S. No. 889,522; June 2, 1908.)

METALLURGY—GENERAL

FURNACE CONSTRUCTION — Improvements in furnace building with reference to making the rear wall resist for a longer period than at present the enormous heat to which it is subjected. Communicated by T. S. Blair, Elmhurst, Ill. (Brit. No. 21,010 of 1907.)

ORE TREATMENT—Process and apparatus for treating ore or like material by the aid of a gradually increasing electric current. Jas. Henry Reid, Cornwall, Stormont, Ontario, Can. (Brit. No. 10,750 of 1907.)

SLIME TREATMENT—Improvements in Apparatus for the Treatment of Metalliferous Slime, etc. Holman Bros., Ltd., Camborne, Cornwall. (Brit. No. 6237 of 1907.)

MINING MACHINERY AND APPARATUS

CONVEYING BELTS—Improvements in Belts for Conveying Coal and Other Minerals, or the Like. William Henry Johnson, Manchester, Eng. (Brit. No. 28,173 of 1907.)

DRILL—Pneumatic Drill. Martin Hardsocg, Ottumwa, Iowa. (U. S. No. 888,164; May 19, 1908.)

MINE CAGES—Safety Device for Mine-Cages. Charles Shewan, Plymouth, Penn. (U. S. No. 889,408; June 2, 1908.)

MINER'S LAMP—Improvements in Electric Lamps for Miners' Helmets and the Like. Johann H. and Alexander B. Drager, Lubeck, Germany. (Brit. No. 559 of 1908.)

MINE-ELEVATOR. William Channon, Des Moines, Iowa. (U. S. No. 890,124; June 9, 1908.)

MINER'S LAMP. William Tunnessen, Hazleton, Penn. (U. S. No. 888,768; May 26, 1908.)

ORE-SAMPLER. Charles L. Constant, New York, N. Y. (U. S. No. 888,471; May 26, 1908.)

ROCK DRILLS—Improvements in Chucks or Tool Holders of Rock Drills. Holman Bros., Ltd., Camborne, Cornwall, Eng. (Brit. No. 9244 of 1907.)

STONEWORKING MACHINERY — Improvements in Stone working Machinery. Ernest L. Pourtauborde, Paris, France. (Brit. No. 16,610 of 1907.)

ORE DRESSING

CONCENTRATING—Apparatus for Concentrating Ores. Ernest Wurdack, Baxter Springs, Kans. (U. S. No. 890,007; June 9, 1908.)

CONCENTRATION—Slime-Saving Device for Ore-Concentrators. Bert E. Duggan, Telluride, Colo. (U. S. No. 889,300; June 2, 1908.)

GRINDING MACHINES—Improved Means for Preventing Damage or Breakage of the Working Parts of Grinding or Crushing Machines. Ernst Schonberg, Bokeloh, near Wunstorf, Prov. Hanover, Germany. (Brit. No. 2424 of 1908.)

GRINDING MILLS — Improvements in Grinding or Crushing Mills. Jacob Lutjens, Hanover, Germany. (Brit. No. 18,120 of 1907.)

JIGGING MACHINERY for Dressing Ore. Gilbert J. Dawbarn, Ballarat, Victoria, Australia, assignor, by mesne assignments to Allis-Chalmers Company, Milwaukee, Wis., a Corporation of New Jersey. (U. S. No. 888,-964; May 26, 1908.)

ORE-SCREEN. Frank Franz, Burke, Idaho. (U. S. No. 889,673; June 2, 1908.)

SEPARATION—Apparatus for Electrical Separation of Particles from a Fluid Stream. Lawrence N. Morscher, Enterprise, Kans., assignor to William J. Ehrsam and Lawrence N. Morscher, co-trustees, Enterprise, Kans. (U. S. No. 888,638; May 26, 1908.)

SEPARATION—Improvements in Apparatus for Disintegrating and Partially Separating Tough, Fibrous, Hard, Mixed or Crystalline Materials. Herman Penther, Greenbank, Farington, near Preston, Lancashire, Eng. (Brit. No. 13,717 of 1907.)

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

C. S. Herzig, of London, is examining some mines in Spain.

R. R. Horner has opened an office as mining engineer at Spokane, Washington.

C. J. Stone has gone to Salt Lake and points in Nevada on professional business.

Walter Harvey Weed, who has been examining mines in the West, has returned to New York.

Dr. R. W. Raymond intends to sail for Europe about July 1. He expects to be absent about a month.

E. N. Atkins, of the firm of DeGolia & Atkins, San Francisco, is examining mines in Trinity county, California.

Dr. Wm. B. Phillips, mining engineer, Birmingham, Ala., has gone to the Cobalt district in Ontario, Canada, to examine mining property.

Forbes Rickard, of Denver, has been appointed manager and consulting engineer of the Hearne Gold and Copper Company at Central City, Colorado.

Frank B. Smith, of Edmonton, Alberta, inspector of mines for that Canadian province, has lately been examining coal properties in the Nicola district, northern Similkameen, British Columbia.

F. C. Bowman, formerly manager of the Japan-Flora at Savage Basin, near Telluride, Colo., has been appointed manager of the Frontenac Mines Syndicate, Ltd., near Central City, Colorado.

James W. Abbott, of Pioche, Nev., is visiting the East to attend the fortieth anniversary of his class at Yale University. His headquarters, for a short time, will be at No. 19 Congress street, Boston.

R. R. Gooddell, who for the past 43 years has been resident agent for the St. Mary's Mineral Land Company, in the Lake Superior district, has resigned and Frederick W. Nichols has been appointed his successor.

M. K. Rodgers, of Seattle, Wash., formerly manager of the Yale Mining Company and the Daly Reduction Company, at Hedley, Similkameen, B. C., last month visited that camp after an absence of several years.

C. H. Poirier has resigned the management of the Red Oak Mining Company at Georgetown, Colo., and has gone to California to look after mining interests. He is succeeded by M. D. Chestnut, Jr., of Red Mountain, Colorado.

Hermann A. Keller has been appointed consulting engineer for the Cieneguita Copper Company, of Sonora, Mex. He went to the mines early this week, in company with George Beebe, president of the company, and expects to be absent for six weeks or two months.

James D. Ramsay, superintendent of motive power of the Calumet & Hecla mine, has resigned to take effect Sept 1. Mr. Ramsay has been connected with this company for the past 40 years and is retiring from active life; he will make his future home at Ann Arbor, Michigan.

William Kent announces that his connection with Syracuse University, where for five years he has held the position of dean and professor of mechanical engineering in the College of Applied Science, has terminated. He expects to devote a year to literary work, especially the revision of his books.

Kirby Thomas, of Denver, Colo., has become interested in the *Mexican Mining Journal*, and has moved to Mexico City to take full charge of the editorial management. Mr. Thomas is a graduate of the University of Wisconsin, resided at Superior, Wis., a number of years, and has written extensively on Lake Superior iron mining operations. He has recently been connected with the *Mining World*, of Chicago.

Obituary

Edward P. Mucklow, who died in Philadelphia, June 17, was born and brought up in the anthracite region in Pennsylvania, but had been a coal operator in West Virginia for a number of years past. He was one of the first to open up the Paint creek district in the Kanawha region, and was interested in several large mines. He was secretary and treasurer of the New River-Kanawha Fuel Company.

Societies and Technical Schools

Engineers' Club of Philadelphia—This organization has removed its headquarters to 1317 Spruce street, Philadelphia.

Lake Superior Mining Institute—The thirteenth annual meeting is held this week, June 24-27, on the Mesabi range in Minnesota. An outline of the program will be found on another page.

Pennsylvania State College—This institution has appointed Dr. Walter R. Crane dean of the School of Mines and Metallurgy. Doctor Crane has had experience as a mining engineer and has been professor at the University of Kansas and more recently in the School of Mines of Columbia University, New York.

American Institute of Mining Engineers—Notice is given that the 95th meeting of the Institute, for the reading and discussion of papers, will be held at Birmingham, Ala., beginning Sept 29. Arrangements are being made for a special excursion after the meeting, which will take in Chattanooga and Ducktown. This will depend largely upon the number of members ready to join in such a trip.

Construction News

Sunshine, Colorado—The Minnie Belle Mining Company, organized by Dakota and Iowa people, is interested in this district and will install new machinery. T. E. Litzenberger, Sunshine, Colo., is manager.

Jamestown, Colorado—The Goldfinch Mining and Milling Company has been organized to operate a group of claims near Jamestown, install electric power and build a 50-ton mill for its own and custom ores. L. W. Aldrich, Boulder, Colo., is manager.

Willis Gulch, Colorado—The Hearne Gold and Copper Mining Company is making arrangements to install a complete electrical equipment for its property in Willis gulch. H. W. Kane, Central City, Colo., is secretary and treasurer of the company.

Apex, Colorado—The Derby Mining and Milling Company, controlled by Denver and Eastern people, is arranging for installation of a steam plant and other machinery and carrying out increased developments; also erection of new surface buildings. O. S. Storrs, Apex, Colo., is manager.

Pine Creek, Colorado—The Golden Geyser Mining Company, owned by Boston people, has become interested in a large group of claims in Pine Creek district and will carry on heavy developments. The company is figuring on the erection of a concentrating mill. Post-office address is Tolland, Colorado.

Yankee Hill, Colorado—The Alice Development Company, in which Idaho Springs people are interested, has taken hold of the Alice property near Yankee Hill. W. L. Shaffer, Idaho Springs, Colo., is manager and is arranging for the erection of a small concentrator to test thoroughly the large bodies of low-grade ores.

Black Hawk, Colorado—The Gilpin Ore and Reduction Company is interested in the purchase for $10,000 of the Gilpin mill at Black Hawk and will erect a concentrating plant of 100 tons initial capacity. The company has also purchased the former Miners' Ore Sampling Works and figures on an ultimate capacity of 250 tons per day. Harry W. Kane, Central City, Colo., is manager.

Northern Colorado Coalfield—The old Vaughn coal mine has passed into the hands of Swenson & Magnunson, who will improve the property with a modern plant. Nels Magnunson is superintendent.

The plant of the Standard Coal Company, in the Northern Colorado field, recently destroyed by fire, is being rebuilt more extensively, and along more modern lines. The company is figuring on new air compressors, automatic dumping tipple, cages, etc. A. D. Sanders, Lafayette, Colo., is superintendent.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Goldfield, Butte, Salt Lake City, Denver, San Francisco and Mexico

REVIEWS OF IMPORTANT EVENTS

San Francisco

June 15—The Jasperine Mining Company, of San Diego, has purchased quarrying, cutting and polishing machinery, in order to work the product from the Jasper mines in the Donahue mining district, near Dulzura in San Diego county. This is considered the only genuine jasper deposit in the West and it is extensive. About 15 acres of the hill have been tested and much beautiful material has been found. Streaks of red-brown, green and yellow jasper make fine material for decoration. The deposit has been known for 20 years, but this is the first attempt to utilize it on a commercial scale.

The gold-bearing gravels near Jolon, in Monterey county, are now to be worked by the Great Ruby Mining and Lead Company and with a machine devised by the superintendent, W. A. Huelsdonk. This is somewhat like a small dredge, having a hull or boat on which is mounted a gasolene engine which runs an endless chain carrying steel buckets. The gravel is elevated about 10 ft. and dumped into a shaker where it is washed with water supplied by a centrifugal pump. The material falls on another system of shakers where the gold and black sand are separated from the lighter material. The coarse gravel is carried away by a small elevator. The machine as constructed costs about $6000, and, it is claimed, will do its work with a comparatively small supply of water. In that section water is scarce, but enough has been developed to operate this new machine.

The San Diego Chamber of Mines, recently organized, has leased permanent quarters in that city and will place on exhibition minerals not only from the various districts in that county, but from the entire southern portion of the State. The collection of minerals now being made is intended not only for local interests, but may be shipped to any exposition desirable to illustrate the mining conditions of the county. The secretary of the chamber, O. J. Kennedy, is prepared to answer inquiries as to the various mining districts in the county.

People still continue to prospect for oil in the upper counties such as Marin, Mendocino, Colusa, etc., but with little or no success. While there are indications which appear satisfactory, no commercial yield has been made. In Livermore valley, Alameda county, a number of leases of lands have recently been made, extending over into the adjoining county of Contra Costa, and a systematic investigation is now being carried on in the hope of developing oil in paying quantities.

In the same county of Alameda, on the Dougherty ranch, at Dublin, men have been at work of late in some gravel beds carrying a little gold and have now found a quartz ledge which is being prospected. This is in an agricultural and grazing section where gold was hardly expected to be found. Oakland men are carrying on the work. Few of the gold discoveries in the Coast Range regions of California have ever amounted to much in the end.

The Long Horn Consolidated Mining and Milling Company of Long Beach, Los Angeles county, whose properties are in Garrett cañon, near Long Horn Springs in the desert near Victorville, San Bernardino county, is involved in difficulties. Suits have been filed against the company for wages, and a mortgage is also on record.

The Grey Eagle mine, Washington district, Nevada county, with its 10-stamp mill, compressor and drills, houses, hoist, etc., has reverted to the State of California, through the delinquency for taxes amounting to $4500. The taxes became delinquent five years ago and the owner of the mine, and the company operating it through a bond, were given all the time the law allows in which to redeem it. Having failed to meet the requirements of the law the State seized the property. It is now in the possession of the State and will remain there until such time as the law says it shall be put up at public auction to satisfy the taxes that are due upon it. About 1500 ft. of drifts have been driven on the mine and the equipment is excellent.

The Klau quicksilver mines, near Paso Robles, San Luis Obispo county, whicl has been idle for some time, are being reopened. New furnaces are to be installed, and the entire plant remodeled, under superintendence of Newton Kelsey. The mines were operated successfully for some years until the price of mercury fell below a profitable point when they were closed. Now that prices have risen new people have taken hold of them with the intention of making them again productive.

Goldfield, Nevada

June 16—By order of Judge Langan the Florence Goldfield Mining Company must before June 27 pay into the court to be there impounded the sum of $117,936 which it has been withholding from the Little Florence Leasing Company. The parent company sued the leasing company for $125,000 for ore extracted contrary to contract it was claimed. Thereupon the leasing company filed a suit for more than a million dollars for alleged damages from interference, circulation of false reports, etc. In retalliation the parent company refused to turn over $158,073 which it had in its possession due to the lease from the sale of ore. The leasing company asked the court to impound this money until the dispute between them was settled. This the court has now ordered done.

Immediately after this order was issued the Little Florence filed an amended complaint against the parent company for another million dollars. The new demand is based upon operations on a strip of ground of very small area but immensely rich. The Florence company several months ago brought action against the lease to restrain it from extracting ore from this ground. The Little Florence now assumes the aggressive and claims that Lockhart himself planted the stakes by which the company was working. It claims every pound of ore within the disputed area which is estimated to be worth over $1,000,000, since during the two months the ground was worked more than a quarter of a million was extracted.

The first conviction for high-grading was secured this week against two miners "caught with the goods" in the workings of the Rogers lease, the ore in question being worth $2 to $20 per lb. Many arrests for high-grading in Goldfield have been made, but until now the district attorney has never been able to get a conviction.

Another interesting case was decided this week, the trial of Gipple for burglary in attempting to rob the plates in the Nevada Goldfield Reduction Works last fall. Gipple's defense was novel. He was approached by the watchman of the works, by name Jones, who suggested the scraping of the plates as an easy graft and told of a certain night when the mill would not be running. Gipple put the matter up to Kline, a citizen of Goldfield, and they attempted to pull off the job. Jones was acting with the full knowledge of the works management who suspected Kline of crookedness although he then occupied a good standing in the community as a prosperous jeweler. The mill was not even locked on the night of the attempt and when the scraping was well under way the sheriff and his deputies in hiding ordered the men to throw up their

hands. Gipple ran and escaped only to be arrested later. Kline was shot and died without regaining consciousness. Gipple's defense was that the idea of scraping the plates having come from the company's watchman who was acting for or with the full knowledge of the company's officers, that his act could not be considered burglary. Fortunately for the company the ethics of the case was not a point at issue.

F. L. Ransome of the U. S. Geological is in Goldfield to complete his report on the district published preliminarily two years ago. At that time the deepest workings were 300 ft. on the Combination and Jumbo. Mr. Ransome expects to be here five or six weeks to make a thorough study of these deposits which are peculiar to themselves and occur nowhere else of this particular type. Uufortunately, owing to the delay at Washington the report will not be ready for distribution until next summer.

The irony of fate is again manifested by the sight of "Death Valley Scotty's" automobile badly battered and practically useless abandoned on the desert and attached for a $50 debt.

Salt Lake City

June 14—The May production of the Camp Floyd or Mercur district was approximately $70,000 in gold bullion, representing the gross earnings of the Consolidated Mercur mine, the only producer in the camp of any consequence at this time. For some months past the management has devoted considerable energy toward the exploitation of the Golden Gate mine, out of which Capt. J. R. De La Mar obtained dividends aggregating more than $1,000,000 before selling it to the present owner. A number of old stopes, rendered inaccessable by caving ground, have been made available again in addition to the development of virgin territory. Much of the ore now going to the mill is obtained from this source.

The Tintic Smelting Company will double the capacity of its lead smelter as soon as the initial unit is placed in commission, which will be some time in July. Contracts for the additional material and equipment will be made within a week.

It will be fully a month yet before the United States lead smelter at Bingham Junction resumes operation under the provisions of the modified decree from the Federal court. The work of installing the battery of converter roasters and reconstruction of the bag-house system, however, is nearly completed. As the process by which the smelting company hopes to remove every possibility of smoke litigation in the future includes the introduction of zinc oxide into the fumes—the zinc performing the function of neutralizing the sulphuric acid gas—the company has contracted for the output of a zinc mine at Good Springs, Nevada.

In a decision rendered in the district court, the Ontario won out against the Wasatch Irrigation Company. The plaintiff set up the complaint that the adit built by the defendant to drain its mines had tapped the water of certain springs which were the source of supply of the irrigation canals of the plaintiff company. The court held that the evidence produced was not sufficient to establish the contention.

Attorneys of the Silver King Consolidated Mining Company have applied to the Federal court for a decree directing the Silver King Coalition Mines Company to permit the engineers of the first-named corporation to make a survey of the underground workings of the Coalition mine, or such portions thereof as are believed to have been extended into the Consolidated's possessions. This comes as a result of the filing of suits recently against the Silver King Coalition Company, in which the latter is charged with having extracted ore of the value of about $1,500,000 unlawfully.

Butte

June 18—Production has been somewhat curtailed owing to the damage done by the recent floods. The road of the Great Northern Railway between Butte and Great Falls, seriously damaged by washouts, will not be ready for use beyond Helena until the first week in July. The Boston & Montana smelter at Great Falls will be in condition to receive shipments within a month. The Washoe smelter at Anaconda is now treating the ores from the Anaconda, Coalition, Butte & Boston and North Butte companies and also as much of the Boston & Montana ores as it can handle. The smelter during the month of May turned out 20,000,000 lb. of copper, breaking its previous record by approximately 1,500,000 lb. and this in spite of the fact that nearly 500 less men were employed than during any previous month. This is a striking example of the effects of the retrenchment policy adopted by the Amalgamated companies during the past few months. A. L. Plumb, representing the American Zinc, Lead and Smelting Company, is now in Butte and will remain all summer. It is reported that Mr. Plumb is here for the purpose of examining into conditions in this State with a view to reporting on the advisability of establishing a reduction works.

Denver

June 19—Stockholders in Stratton's Independence, Ltd., on this side of the water, are in receipt of telegraphic information that a meeting of the company is called for the purpose of considering the advisability of a reconstruction of the company, with 1s. call on the shares, and in this way to raise the sum of £50,000 to pay off the indebtedness on the property, and to open out and prepare the mine for the production of low-grade ore for the mills. It would appear that with the extensive caving of the mine last summer, the lease production fell off, and the mine for some time did not cover operating expenses, although it was operated under lease, and so the money designed for the mills went to pay off mine debts to some extent; whereas the directors expected to make a profit of about £15,000 from this source while the mills were in course of construction.

The mills were practically completed toward the end of March last, though it was noticed that big reductions were made in the working force in February, for what cause was not then apparent to the outsider. It is now evident from published statements to the shareholders, that the reasons were financial, and the radical step of reconstruction is now being taken to remedy this condition.

Meanwhile, an important strike has been made on the Potvain lease of the Washington claim, where a shoot averaging 3 ft. of $60 ore is reported, while the lessees generally throughout the mine are said to be doing well, with the general outlook better than it has been for a year past.

Mexico

June 16—There appears to be no doubt that the great objections raised against the anti-foreign articles in the proposed new mining law will have considerable weight and may be instrumental in preventing their adoption. To the objections from the Mining Chamber Olegaria Molina, Minister of Fomento, has replied that the articles are but precautionary measures, and for the purpose of putting the companies under government control so as to exclude or prevent monopolies and trusts. But he has consented to place the whole matter before the Cabinet of Ministers for their approval or non-approval.

It seems that the whole bill is of a character that may be decreed by the president without consultation or consent of congress. It is probable, therefore, that the proposed law may never be presented before that body, but that after having been discussed at a number of meetings of the cabinet it will be handed to the president, with the recommendations of the cabinet, such as they may be, and that the president will make final disposition in the nature of an executive order embodying the whole, or any part, of the new measure. President Diaz's fairness in the past in his treatment of all foreigners has led the majority to believe that the objectionable articles will be so modified as to be no longer objectionable or else cut entirely out of the bill. Several months may possibly elapse before the final decision is reached, but the decree of the president will be looked for with greater interest than has been given any other mandate from that source for many years.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

COCHISE COUNTY

Calumet & Arizona—At the smeltery in Douglas much has been done lately to improve and enlarge the plant. When all the new additions are completed the plant will have 3000 tons daily smelting capacity, instead of 1500, as at present. In order to make room for an additional furnace, it is necessary to move the converters to the opposite side of the building. Foundations are laid for five converters, four of which are to be moved from the other side of the building, and one new one added. A large additional Nordberg compressor is installed in the power house, and the one now in use will be moved. As soon as the converters are moved, a new 500-ton furnace will be erected in line with the other five. The track is laid for an entire new trackage system for handling the slag. At present the slag is handled over one track. With the new system there will be a separate track for each settler. It is planned to enlarge the old furnaces by making them each 10 ft. longer, thus changing their capacity from 300 to 500 tons each. The company is doing considerable exploration work on three outside properties in Arizona: one at Dos Cabezos, another near Gleeson, both in Cochise county, and the third a short distance from Mammoth in Pinal county. The property near Mammoth, known as the Copper Giant, is opening up very satisfactorily.

Shattuck-Arizona—A number of the officials including L. W. Hill, have been in Bisbee going through the mines, and at Douglas looking over the new smelter site. Nothing official has been given out in regard to the erection of a reduction plant at Douglas.

Butte & Arizona—This company's property, which is in the Huachuca mountains, Cochise county, was recently closed down.

PINAL COUNTY

Superior & Arizona—This mine, at Superior, has begun unwatering. The force of men will be increased from time to time as development proceeds.

Oklahoma Copper Company—This company, at Mineral Hill, will resume at an early date. During the temporary cessation of operations new machinery has been received.

Newbury—This property, in Pinal district, has repaired the wagon road from the mine to the line of the Phœnix & Eastern railway. Several cars of machinery have been received. The mine shipped three carloads of ore to Denver last month to test its value with a view to the erection of a smelter.

Copper Creek Company—This company, at Mammoth, recently shipped five carloads of ore to the Denver smelter and has received several carloads of machinery, including several tons of wire cable with which an aërial tramway will be constructed across the Gila river. This cable will enable the mine to operate during the several months of high water.

YAVAPAI COUNTY

Silver Cord—This mine situated near Turkey, has been taken under bond and lease by F. P. Cavanah and associates from C. W. Ruffner. The mine is a shipper. The ledge is small, but runs high in gold, silver and lead. About $3000 worth of ore has been extracted during the last month. Mr. Cavanah will at once equip and develop the property.

Emporia—These mines, situated six miles south of Prescott and near the Alcazar mines, have been sold by H. H. Keays to Eastern parties, who are preparing to develop to considerable depth; 20 men are now employed in building a camp and installing necessary machinery for deep workings.

Monica Mines Company—This company is installing an additional 10 stamps at its mill near Kirkland; 10 stamps were installed in February. The new batteries will be in operation in about 15 days.

Buffalo-Arizona—This company, from its mines near Turkey, shipped a $2000 bar of bullion last week, and it is said will make regular shipment from now on. The ores are of about the $18 grade and mill well.

Congress Consolidated Mining Company—This company is making a regular output of high-grade concentrates, the ore milled being taken from the lower levels of the mine. The mines are at Congress.

Arizona Smelting Company—J. Kearney Rice, trustee in bankruptcy for the Consolidated Arizona Smelting Company and the Arizona Smelting Company, is in Prescott making arrangements for the sale of the property of those companies which is to take place on July 25.

Mount Elliot Consolidated Mining Company—This company has made another shipment of bullion to the mint, valued at about $4000. The company has been making regular shipments of bars of about the same size for several months.

Octave Mining Company—The company sent out a $65,000 shipment of bullion last week, this representing the battery clean-up for the past month. Two cars of concentrates were also shipped.

California

BUTTE COUNTY

Hidden Treasure—Crabtree & Cheshire Brothers have started work on this group of claims at Forbestown.

CALAVERAS COUNTY

Morgan—This old and once famous mine at Carson Hill, near Angels, is again to be worked; men are clearing out the old drifts. English capitalists are furnishing the money.

Marlita Mining Company—This company, R. P. Williamson, superintendent, has commenced operations in Mokelumne Hill district. This is at the base of Stockton hill, famous for its rich gravel channels.

South Carolina—At this property—the east extension of the Melones mines at Melones—Smith & Dexheimer are taking out 100 tons of ore from the 600-ft. tunnel for a mill test of the 10-ft. ledge.

EL DORADO COUNTY

Martin—This mine near Grizzly Flat, recently discovered by the Martin Brothers, has made its first bullion shipment from a run of 200 tons of ore.

INYO COUNTY

Skidoo Mill—The capacity of the mill at Skidoo has been doubled and a cyanide plant is being put in.

MADERA COUNTY

Texas Flat—At this property, near Coarse Gold, formerly the Hearst mine, 40 men are at work, and the 30-stamp mill is kept busy on ore from the fine body recently discovered.

MARIPOSA COUNTY

Ravel Estate—B. S. Richards is organizing a company to open and develop certain mining claims on this estate at the head of Sweetwater creek, two miles from Jerseydale and seven miles south of Hite's Cove.

Virginia—This property, near Coulterville, is being reopened and a number of men are now employed.

NEVADA COUNTY

Midas—The test run on average ore from this mine showed results of $27.50 per ton. A local company will develop the property.

Richland—Operations will commence next month to open up the channel of this drift mine. The property is on an unworked portion of the Manzanita channel.

Sierra Queen Consolidated—This new company has bonded the Sierra Queen mine at Nevada City, and operations will shortly be resumed at the point where the old company ceased work.

PLUMAS COUNTY

Cinnabar—S. C. Keever and H. D. Seaman, of Quincy, have discovered a body of cinnabar ore north of Quincy, and near the line of the Western Pacific railway.

SAN BERNARDINO COUNTY

Fremont Mining, Milling and Development Company—This company has installed an engine and hoist and is preparing to erect a 10-stamp mill.

Hart-Florence Mining Company—This company has been organized to take over the Florence group of claims at Hart, lying north of the Jumbo and south of the Oro Belle No. 1.

SAN DIEGO COUNTY

Buckhorn—In this property at Dulzura they have found rich rock in a wide vein. Chas. Meacham is superintendent. The strike was made in a new tunnel.

Cleveland-Pacific—The small mill on this property at Escondido was started up two weeks ago on $25 rock. A new lease has been let on the extreme southern end of the property.

Dulzura—Some high-grade ore is reported as found in the Daisy claims of this company at Dulzura. The ledge is about 3 ft. wide.

SHASTA COUNTY

Eastside—This mine near Coram, owned by Lowenthal, Ames & Bedford, is now making shipments to the smelters at Kennett.

Keystone—This mine at Old Diggings, owned by Edward White, has been bonded by Oregon men who will develop it and put on new machinery.

SIERRA COUNTY

Colombo—Wm. H. Fleming, representing Colorado men, has bonded this old mine at Sierra City.

SISKIYOU COUNTY

Hull Gulch—At this property, recently purchased by Tacoma, Wash., men, a new 10-stamp mill is being erected. Three hoists have been installed.

TRINITY COUNTY

La Grange—This hydraulic mining company has just rceived from Michigan a shipment of 500 tons of rails for use as riffles in the extensive flumes at the mines. The rails differ from the regular railroad rails only in the matter of length, these being 6 ft. long.

TUOLUMNE COUNTY

Dreisam—In this mine at Arrastraville, J. E. Connelly, superintendent, the recent strike is developing into an important one as work progresses. The ledge is quite large and the ore shows free gold.

Joe Hooker—At this mine the old incline shaft has been cleaned out and the work of sinking commenced.

Sunnyside—At this mine, six miles from Tuolumne, the 10-stamp mill is being kept busy and 20 men are at work. New machinery and electric lights are being put in.

Colorado

In the northern coalfield no agreement has been reached on the mining scale, and on June 19 the miners, about 2500 in number, stopped work. No strike has been formally declared, but the miners voted to cease work, pending further negotiations.

BOULDER COUNTY

Eastern Colorado Power Company—Work is being resumed on the dam and reservoir projects in Middle Boulder cañon and a force of about 1000 men will soon be at work. The plant is intended to furnish about 30,000 h.p. and will mean an expenditure of about $2,000,000, with power distributed to Boulder and Gilpin counties.

Good Luck—It is reported that this company will arrange for the construction of a 50-ton cyanide plant near Sugar Loaf, to treat its ores.

Ward Struggler—Work is to be resumed on this property at once with C. M. Mitchell, as manager.

CLEAR CREEK COUNTY

American Sisters—This group of 23 claims has been sold for a consideration of $200,000 of which $50,000 has been paid down, to James A. Mears, of New York. The new purchaser will overhaul the mill at the Headlight shaft.

Rosecrans—Eastern people have become interested in this property in Empire, and will arrange for the installation of machinery.

GILPIN COUNTY

Fifty Gold Mines Corporation—A strike of free gold is reported from the 1300 east level of the Fisk mine, streak being 12 in. wide and assaying high in gold and silver. In the Bobtail 1400-ft. level a 4-ft. body of smelting ore has been opened up, and there is a 7-ft. vein of amalgamating ores of fair grade. O. B. Thompson, Black Hawk, Colo., is manager.

War Dance—A strike of sylvanite ore has been made showing high assay values in gold, with some silver. Returns of $1350 per ton have been received from a shipment of first-class ores, with other lots going $300 and over $400 per ton. The find was made at a depth of 140 ft., and the rich strike has caused considerable development work in that section to be commenced. Pennsylvanians are the owners and it is being worked by C. O. Richards & Co., of Central City, under a favorable term lease.

LAKE COUNTY—LEADVILLE

Big Evans Gulch—In this section a number of prominent mining men are looking into propositions that have been idle for years. The cause of the revival is the driving of the Yak tunnel into the basin. The bore has now passed through the Ollie Reed territory in South Evans and is pressing forward to the Resurrection, which will be reached in October. This will solve the water problem that has retarded the development of the section for a number of years. In the meantime a number of new shafts are going down in the basin and will reach the wated level about the same time the tunnel enters the Resurrection territory.

Catawba—As development proceeds on this claim, Little Evans, the recent strike becomes more defined with the orebody wider and more in place. The finding of ore in this property proves that the shafts sunk in the neighborhood in the past never went deep enough; a number of owners of ground are at present planning to sink shafts deeper.

St. Kevin District—With the disappearance of snow from the mountains the summer work is now well under way, and from the present outlook more work will be done this season in the district than for many years. The most important work in the section is the Bowden tunnel which will be driven 4000 ft. and in its course will cut a number of well known veins. W. G. Parker has resumed work on the Little Willie and will sink the shaft another 100 ft.; its present depth is 250 ft. The Huckleberry is shipping a good grade of ore from the lower workings, also the Wilkesbarre. Some high-grade ore is being shipped from the latter property carrying a fair percentage of gold.

Starr—In this mine, Carbonate hill, regular shipments are now being sent out from the recent strike; the ore runs well in silver and lead and carries about half an ounce in gold.

OURAY COUNTY

Camp Bird, Ltd.—The report on working operations of the company for the quarter ended April 30 shows that the mill crushed 20,390 dry tons of ore. Receipts from bullion sold (including cyanide products) were $420,488; concentrates sold, $49,902; totals, $470,390. Working expenses (including develop-

ment, transportation, and treatment of product) were $163,989; net receipts, $306,401. There was also expended on construction account for the quarter $1924; London and other management expenses $4500. On April 7, dividend No. 25, of 1s. per share (£41,000) was declared, payable May 7. The mine report shows: Number of feet driven, 1793; number of feet in raises and winzes, 199; cubic feet stoped, 151,690. On April 30, the total dry ore broken in the stopes amounted to 84,640 tons. Everything at the mine and mills has progressed satisfactorily, and a high state of efficiency has been maintained.

TELLER COUNTY—CRIPPLE CREEK

Ajax—In this mine on Battle mountain, Frank May and Samuel Jenkins, lessees, have found good ore, and are installing an electric hoist.

Ellen McGregor—Kirk & Thompson, lessees on this claim on Gold hill, have begun to ship ore from a vein recently struck in a crosscut from the tunnel level.

Oro—Development work by Charles E. Harrison in this mine on Ironclad hill has opened a body of shipping ore on the 100-ft. level.

Zoe—Shipments have been resumed from this mine on the eastern slope of Gold hill. The mine is worked by lessees.

Idaho

IDAHO COUNTY

Hush Placer Mine—The first clean-up made at this mine is said to have exceeded expectations, although no figures are obtainable from the owners. The property adjoins the famous Buster mine. Much work has been done in the way of fluming, ditching and damming, and but a short time has been devoted to hydraulicking. The hydraulic capacity is to be increased before next season.

Blue Jacket—New supplies and equipment are being delivered and it is stated that work on a new adit will begin shortly. Development consists, it is said, of a 1000-ft. adit, connecting with a 500-ft. shaft. The new adit will be driven 250 ft. lower down to determine the depth of the orebody.

Snow Storm—A strike of free gold ore is announced by the owners. The report has caused a number of persons to stake out claims on adjoining land. The ore was found in the bottom of the lower working tunnel, not more than 110 ft. from the portal. The property is owned by Joe Coverly and Walter and Ralph Pittock.

Indiana

CLAY COUNTY

McIntosh Mines—Trouble is experienced at the McIntosh mines, south of Brazil, from an unusual cause. Recently the heavy rainfalls caused the water to break through and flood the mine. A large number of the mines were unable to recover their tools. The men allege that the company managers were so dilatory in pumping out the water that the roof in the entries fell in many places, preventing them from recovering their property. A meeting of the interested miners has been called to take action.

WARRICK COUNTY

Polk Patch Mine—This mine has suspended work for two weeks, in order to remodel and reconstruct the switch leading from the Southern railway to the mines. A new switch is being built north of the pit-head, which will make it possible to place enough empty flats to run the mines one day. When completed the operators propose to increase the output of the mines.

Kentucky

CHRISTIAN COUNTY

Franklin Coal Company—This company has been organized to open a coal mine at Empire. Bailey S. Franklin is president. Work has already been begun on the shaft.

Michigan

COPPER

Adventure—Operations have been suspended at No. 3 shaft, and the only work being carried on at this property is diamond drilling. Copper-bearing rock has been encountered in some of the drill holes and as the property lies in close proximity to the Lake, there is a possibility of its opening on this favorable formation. The contention that the Lake lode will be found faulted also strengthens the Adventure's chances. The stamp mill has been closed for the last few months and up to the present time both sinking and drifting have been carried on at No. 3 shaft.

Michigan—Work on the stamp mill, at Keweenaw bay is progressing satisfactorily; the building, which is of structural steel, is entirely inclosed and the machinery is arriving and is being rapidly assembled.

Lake—The shaft on this property is down below the 200-ft. level and the same remarkable showing continues throughout. At the first level, which is 160 ft. from surface, drifting to the south is being carried on and the formation in the breast of the drift remains unchanged. Work in the north drift has been temporarily suspended; the formation in that direction has become somewhat shattered and its course is not fully determined. It was deemed advisable to await developments to the south and in the trenching, which is being carried on at the north.

Elm River—This company has started work on a new exploratory shaft, going down to the west of the approximated line of the Lake lode. When sufficient depth has been obtained it is planned to crosscut to the eastern boundry of the property; this will show a cross-section of the tract and expose the various lodes. The Elm River company was organized in 1899 and has carried on exploratory work persistently ever since without successful results. The tract consists of 2300 acres well located in the mineral zone.

IRON

Munro Mining Company—The boiler and engine house at the Chicagoan lake mine was entirely destroyed by fire recently. The near-by shaft house narrowly escaped. The company will rebuild at once.

Missouri

The State Mining Bureau reports coal production in Missouri in 1907 as follows: Shipped by railroad, 3,711,877 tons; sold for local trade, 418,731; sold to mine employees, 25,617; used in operating mines, 118,100; total, 4,374,325 short tons. This compares with 3,989,659 tons in 1906, showing an increase last year of 384,666 tons, or 9.6 per cent. Of the total reported last year, 489,739 tons, or 11.2 per cent. were mined by machine, 28 machines of all types being in use. Coal was mined in 34 counties, Macon county leading, with an output of 1,159,233 tons, and Lafayette county second, with an output of 712,981 tons.

ZINC-LEAD DISTRICT

Aurora—It is reported that options have been secured by some Chicago parties on the fee to nearly all the mining lands in the Aurora district. The deal will require a large sum to complete it.

Big Hurricane—This company recently assigned its lease near Joplin to Alexander C. Thompson, who later transferred it to the Crockett Mining Company.

Coleman Brothers—These operators have made a rich strike on their land, half a mile south of Aurora. A drill hole found 52 ft. of ore at about 250 ft. depth. This is in an entirely new section.

Good—This company is building a second mill on its lease near the Providence, at Webb City.

Greenhorn Mill—This mill, on the Hall land, half a mile south of Duenweg, has been destroyed by fire, the loss being $16,000. It was owned by W. W. Lair, C. H. and Omar Finch, of Aledo, Ill. They will rebuild at once.

Lucky Dog—This company is building a new mill on the Glass lease, on the Carter land, west of the Oakwood mill near Joplin.

Millard & Ross—Lead ore has been struck at 40 ft. in a shaft sunk by this firm on the J. W. Allen land, east of the Lone Hickory lease at Spring City.

Picher Lead Company—This company

is erecting two new lead furnaces at its works, and is enlarging the bag room.

White Dog—This company has been organized with $150,000 capital stock. The stockholders are W. H. Burgesser, Emanuel Siple and J. P. Stephenson, of Nevada, Mo.; Dr. S. G. Popelnell, of Eldorado Springs, Mo.; J. C. Squires, of Carterville, Mo.; C. F. Strohm, of Joplin.

Montana

Butte District

British-Butte—It is officially stated that a contract has been closed for the installation of a gold dredge on the property at Rocker, five miles west of Butte. The contract calls for a 5¾-cu.ft. Risdon bucket dredge, to dig a maximum depth of 30 ft. below water line and to stack the tailings to a hight of 30 ft. above the water line. It is expected that the dredge will be ready for use within six months.

Davis-Daly—Several attachments have been filed against the company within the past week. It is expected that the company will be able to settle the claims out of court within a short period.

Alice Gold Mining Company—Although no work is being done through the main shaft, 12 sets of leasers are mining the silver-gold surface ores. A controlling interest in the shares of this company was purchased by the Butte Coalition Company upon the organization of the latter, and it is expected that crosscuts will eventually be run into Alice ground from the lower levels of the Corra mine, one of the Coalition group. The main shaft of the Alice is at present partly filled with water, as the result of a long period of idleness.

Boston & Montana—Development work still continues on the Green Leaf claim. It is reported that the shaft, now past the 1000-ft. level, will be sunk to a depth of 2000 ft. and the surrounding country thoroughly prospected. This will give the claim a greater depth than any property east of the "Hill" mines, and will give an indication of the prospective value of many other properties in the same locality.

La France—The trouble with the citizens of Walkerville about an alleged dust nuisance from the new zinc mill at the Lexington mine has finally culminated in the institution of injunction proceedings against the company in the Federal District Court. The hearing has been set for August 3.

Jefferson County

Boston & Corbin—President Amster has made public the report of James W. Neil on the company's properties, which consist of nine patented quartz claims. The shaft is now down 225 ft. From the 200-ft. level considerable drifting has been done, thus giving the property a total depth on the lead of 500 ft. Mr. Neil states that the mine is now in condition to produce several hundred tons of copper ore daily, carrying 4.75 per cent. copper and 6 oz. silver per ton. He recommends the erection of a concentrator and a reduction plant on the property.

Eva May—It is stated that operations at this mine are to be continued with renewed activity under the direction of Mr. Higgins, a mining engineer of Butte. A carload of gold ore was recently shipped to the Butte Reduction Works for the purpose of ascertaining the value of the ore. It is the intention of the owners to construct a flume to bring water from Cataract creek to the mill and thus decrease operating expenses by the substitution of water power for steam.

Missoula County

Amador Mining Company—Circular letters to the stockholders of the company state that the experts, recently sent to examine the company's 50 claims, have reported unfavorably on the property. In the neighborhood of $350,000 has been spent upon the properties which, in addition to the claims, consist of a townsite and a railroad nine miles in length. It is probable in view of the report on the property, that operations, which were discontinued some time ago, will not be resumed.

Nevada

Esmeralda County—Goldfield

Output—Production for the week ending June 16 was 2673 tons valued at $195,360, as follows: Consolidated 630 tons; Rogers Syndicate 570 tons; Mohawk Combination 411 tons; Gem Florence 41 tons; Wingfield lease on Florence 226 tons; Goldfield Consolidated Mining and Leasing Company 114 tons; Knickerbocker Jumbo 140 tons; Jumbo New Fuller 340 tons; Sandstorm No. 4, 90 tons; Engineer's lease 25 tons; Mushett lease 46 tons; Parkinson and Newland's lease on Victor 40 tons.

Gold Bar Fraction—A United States patent has been received for the property adjoining the Gold Bar, C. O. D., and Victor, and work will be resumed at once.

Crackerjack—The shaft has reached a depth of 450 ft. A station has been cut and crosscutting started at the 400-ft. level.

Victor—The Victor Mining and Leasing Company has begun shipping from the strike made recently on the 250-ft. level. Many samples of ore assay up to $300 per ton, but the whole vein for a width of 3½ ft. will average less.

Commonwealth—Leasers on this property have opened up a vein which for 3 ft. will average better than $60 per ton while spots run as high as $370. This ore is a mile east of any point which has produced ore in the camp.

Rogers Syndicate Lease—This lease on the Red King claim of the Florence is breaking ore across 4 ft. which runs $500 per ton. This week a dividend of $30,000 was declared bringing the total up to $185,000.

Albemarle—Crosscutting has begun at a depth of 310 ft. on this property. The management is confident, in view of the recent finds of pay ore on adjoining property, of soon striking pay rock.

Conqueror—F. H. Vahrenkamp has taken a least on the property and will start work at once.

Consolidated Red Top Leasing—On the 150-ft. level, north drift, the ore is running from $20 to $60. In the east drift a streak of 30 in. averages $25. In the vein are many small streaks running $10 and $12; the wall has not been reached.

Storey County—Comstock Lode

All the officials connected with the Sturges properties on the Comstock have received notification of large salary cuts this week. The total reduction of operating expenses will be about $55,000 per year. The mines affected are the Andes, Sierra Nevada, Union Consolidated, Ophir, Mexican Consolidated, Virginia, Savage, Chollar, Potosi, Gould & Curry, Alpha, Bullion, Julian and Exchequer. The miners' wages were not only not reduced but it was recommended officially that they be given a percentage of the profits.

Ophir—The output of the Ophir for the week ending June 16, was approximately $16,000. It comprised 167 tons at $32.50 from the 2100-ft. level, 20 tons at $84.60 and 148 tons at $33.76 from the 2200-ft. level and 39 tons at $78.80 and 332 tons at $37.60 from the 2250-ft. level. The temperature in the Ophir stopes runs as high as 135 deg. F. and mining is carried on under the greatest difficulty. Work on the connection between drifts run from the Ophir on the north and the Consolidated Virginia on the south is being driven steadily and when completed fresh air will aid operations underground very materially.

The deepest workings on the Comstock are in the joint winze of the Ophir and Mexican mines through the Union shaft, 3300 ft. vertically, and the Combination shaft of the Chollar, Norcross and Savage companies 3260 ft. deep.

Seven Troughs District

Seven Troughs Florence Mining and Leasing Company—The hoisting equipment consisting of a 15-h.p. Foos-Fulton gasolene engine, gallows frame, buckets, cars, etc., has arrived and is being rushed from the railroad at Lovelocks to the lease where active development will begin at once.

George & English Lease—This lease on the Badger Hill of the Fine Gold has encountered a shoot of ore which runs $225 per ton for a width of 18 in. The shoot has been drifted on 30 ft. and the grade is maintained. Shipments have begun.

Mazuma Hills Company—The 10-stamp mill of this company is expected to be crushing ore within a few weeks.

Friedman Mill—The 10-stamp mill being constructed for the Kindergarten and Seven Troughs Mining companies, will be in operation within a month. A third mill of 100 tons daily capacity for custom ores is expected to be under construction in this camp very soon.

WALKER RIVER RESERVATION

J. C. Group—A sample from the group on Walker river gave returns of $417 in gold per ton, but the whole ledge is said to average $20. An old mill about six miles from the property is expected to start up soon. This new find is about nine miles from Hawthorne, close to the Hawthorne-Bodie road near the old Big Indian mine.

WINNEMUCCA

Slate Quarry—L. R. Ritter, of Salt Lake, is said to be about to develop extensive slate quarries on Blue mountain.

RAWHIDE

A reduction of wages in this camp from $5 to $5.50 to the Tonopah and Goldfield scale of $4 and $4.50 has caused some trouble, and a strike which at first had an ugly look, but everything now points to an amicable settlement and the adoption of the lower scale.

Royal Tiger—The incline shaft has now reached a depth of 200 ft. At the 75-ft. level a crosscut opened a 3-ft. vein of good ore with a rich streak, which averaged $200 per ton.

Kearns No. 2 Lease—Crosscutting from the 200-ft. level and sinking for the 300 are being pushed rapidly. The muck from the shaft runs $3 to $4 per ton. They are sacking shipping ore from the 100-ft. level.

SILVER PEAK

An oil excitement has started here, and prominent mine operators from Goldfield, as well as local people, have been locating ground extensively, 30 sections having already been staked according to report. The geological survey some years ago reported the formation around Blair as favorable for oil, but no effort to explore was made.

Pittsburg-Silver Peak Mining Company—The new mill was run to about 90 per cent. of its capacity in April, and the gross returns were $84,680, of which the directors estimate $45,000 as profit. In May the output was in excess of $100,000 on ore averaging for the month $10.53 per ton.

BULLFROG

Production—The output of the Bullfrog district for May was about $118,407, as follows: Treated at Shoshone mill, 4500 tons; Keane Wonder mill, 1200 tons; shipped from Tramp Consolidated, 22 tons; from lease on Original Bullfrog, 13 tons; from lease on Gibralter, 20 tons; from lease on National Bank, 7 tons.

Homestake-King Consolidated—The 125-ton mill, 25 stamps, of this company will be ready to start on ore in a few days. The contract for this mill was let in December last.

Montgomery Shoshone—A station is being cut at the 700-ft. level and extensive lateral work is planned.

WHITE PINE COUNTY

Nevada Consolidated—It is said that the concentrating mill of this company is making an extraction of upward of 70 per cent. of the mineral in the ore.

North Carolina

CATAWBA COUNTY

Peach Tree Mining Company—This company is preparing to work a placer deposit, 10 miles south of Catawba station. It is said to be large, and several veins of low-grade gold ore are in the tract. B. V. Hedrick, Spencer, N. C., is manager.

YADKIN COUNTY

Courtney Gold Mine—Work is now being carried on at this mine, near Courtney. W. T. McCoy, of Winston-Salem, N. C., is owner.

Pennsylvania

ANTHRACITE COAL

Hollenback—This colliery, near Wilkes-Barre, closed down June 13, and will remain closed about six months, while repairs and improvements are made. The changes will include a new engine house, new boilers, new breaker machinery and a new washery plant. These improvements will put the colliery in shape for an increased production.

BITUMINOUS COAL

Cresson & Clearfield Coal and Coke Company—This company has placed an issue of $500,000 in 6-per cent. bonds having 20 years to run. The proceeds of this issue will be used to install an electric plant at the largest of the company's mines, and to build 100 new coke ovens.

Pittsburg Coal Company—On June 19 an explosion of gas occurred in Ellsworth No. 1 mine of this company, near Monongahela City. It happened just as the day shift was stopping work, and only a few men were left in the mine. Of these, three were killed, two fatally injured, and 15 were caught in the workings. The explosion is said to have been caused by an Italian miner, who carried a naked lamp into a chamber filled with gas.

Pittsburg-Buffalo Coal Company—This company has begun work on its new plant at Marania, 15 miles south of Monongahela City. Three shafts have been completed on the coal land there, and men are now at work driving entries. Work is to be begun soon on 2000 coke ovens.

Royal—The tipple and other surface plant of the Royal coal mines at Argentine, near Butler, were badly damaged by an explosion of dynamite on June 16. There have been labor troubles at the mines, and several suspected persons have been arrested.

South Dakota

CUSTER COUNTY

Goldfield Group—The main shaft is down 65 ft. and in free-gold ore that is showing well with development. Drifts each way will soon be started.

Grand Junction—C. Vondeleer has unwatered this property and expects to start active operations soon. Old drifts are to be worked in an effort to secure some of the high-grade gold ore the property formerly produced.

High Bar Placer—Work will be resumed some time this month by Nevin & Layton who have rigged up a small machine for summer use.

Saginaw—The new cyanide annex to the mill will be in operation by the middle of July. The Saginaw will then treat 150 tons per day.

LAWRENCE COUNTY

Gilt-Edge-Maid—Ore running high in gold has been uncovered in the old workings and is being sacked for shipment to this smelter.

Golden Crest—Work on the new treatment plant will soon commence. Both the capacity and style of plant are yet to be determined, but it will likely be of 200 to 300 tons daily capacity, with improved methods of leaching.

Utah

SALT LAKE COUNTY

Utah Copper Company—In May this company produced upward of 4,000,000 lb. of copper. The concentrating plant is now treating 5000 tons of ore per day, averaging 1.6 per cent. copper, from which 20 lb. of copper per ton is recovered. It is expected that the ore will average in the neighborhood of 2 per cent. copper when the steam shovels have dug further into the orebody.

SUMMIT COUNTY

Park City Shipments—The ore output of Park City last week amounted to 497 tons, the contributing mines and amounts being: Daly-Judge, 237; Silver King Coalition, 260 tons.

Nelson-Queen—This property has passed into control of a Philadelphia syn-

dicate. New mine equipment has been ordered and the shaft is to be sunk to the 1000-ft. level.

Silver King Coalition—This company has purchased the Jupiter mine, an adjoining property, consisting of 114 acres.

TOOELE COUNTY

Boston-Sunshine—Steps will shortly be taken to resume production at this property, which is equipped with a good mill. The mine contains a large tonnage of developed low-grade gold ore.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending June 13 were as follows: Coniagas, 63,100 lb.; Kerr Lake, 57,980; McKinley-Darragh, 123,600; Nova Scotia, 43,990; Little Nipissing, 40,110; O'Brien, 276,330; Right-of-way, 61,050; Hudson Bay, 65,000; Trethewey, 67,600; total, 798,760 pounds.

Buffalo—New buildings for sampling and additions to the cyanide plant have been erected and also a new storehouse and office. The company is making preparations to treat a large tonnage of low-grade ore.

Chambers-Fernald—This property, adjoining the La Rose, Nipissing and O'Brien, has been purchased by a Montreal and Toronto syndicate. Development was delayed by disputes over titles, etc. An operating company is being organized, capitalized at $2,500,000. Two shafts are now being sunk on high-grade ore. The settlement of the title involved the payment to the Ontario government of a 25 per cent. royalty on the output.

Temiskaming—About 60 men are at work. The main shaft has been sunk 260 ft. A new self-dumping skip, recently put into operation, is the first of its kind in the camp. In a winze sunk below the 175-ft. level the post-Huronian diabase formation was encountered underlying the older Keewatin, but the high silver content was found to continue in the lower formation.

ONTARIO—SILVER LAKE DISTRICT

Obisse Location—Nearly a carload of high-grade silver ore has been taken from an open cut. A shaft has been sunk on one of the veins and active development is being carried on.

ONTARIO—LAKE OF THE WOODS DISTRICT

Crystal—This gold mine at Wahnapitae, Ont., has been sold by Patrick Shannon, of Pembroke, Ont., to a Toronto syndicate including John T. Ryan, Stafford Higgins and Gordon C. Jennings. Mr. Shannon retains an interest. The mine was worked for three years and considerable development was done. Machinery was installed and one shaft was sunk 185 ft.; but the work was abandoned on account of transportation and ventilation troubles. A new company is being organized to be known as the Crystal Mining and Milling Company, and work will be resumed in charge of Charles Baycroft. A 10-drill air compressor will be installed and five stamps added to the stamp mill, making altogether ten stamps.

Mexico

CHIHUAHUA

Rio Plata—The last car-lot shipment of crude ore and concentrates from this company's mines near Guazapares netted more than $51,000. Good progress is being made in the erection of a 200-ton cyanide plant as well as in the betterment of the water-power system for the mine and mill. The properties were lately visited by President H. W. Miller and other New York stockholders, as well as by T. H. Oxnam, the latter supposedly in the interests of prospective English investors. In common with other mines in the Sierra Madre mountain districts operations are temporarily handicapped by a shortage of water.

Chihuahua Copper Mining Company—This company's 50-ton concentrating plant in the Choreras mountains, reached from Falomir station on the Kansas City, Mexico & Orient road, has been in such successful operation since its starting up about two weeks ago that machinery for a second unit of like capacity has just been ordered for immediate delivery.

Esmeralda—This mine at Sta. Eulalia has been sending out ore for the past two weeks at the rate of a carload every other day, and plans are under way for increasing this tonnage. The product is going to the Torreon smeltery. Howard Anderson is the manager in charge.

Dos Abril—Arrangements are being made for the early starting up of the 30-ton amalgamation plant at this mine in the Dolores section. C. Riddle, the manager, is now at the mine directing the work.

American Smelting and Refining Company—It is now given out that the new plant near Chihuahua will be put in commission early in July, two furnaces being ready for blowing in. For the past six weeks, ore from the company's Sta. Eulalia mines has been sent regularly to the plant, while a number of other companies heretofore sending their product to the El Paso smelter are now marketing at the Chihuahua plant. The company's sampling works at Chihuahua are still receiving custom ore.

Bullion Shipments—For the week ending June 13, the Banco Minero, of Chihuahua reports the shipment of 81 bars of silver bullion, valued at 90,000 *pesos*, from the Batopilas mine and 15 bars gold-silver bullion, valued at 40,000 *pesos*, from the Waterson Gold Mining Company.

Rio Tinto—These copper mines at Terrazas, which have been under option to and worked by the Rio Tinto Mines and Smelting Company have reverted to the original owners, Juan A. Creel and associates, of Chihuahua, on account of payment forfeiture. The properties are now being worked by the Compañia Minera Rio Tinto Mexicana under the management of David Goodale. It is believed that the smelter will be in operation again shortly.

La Republica—General manager M. B. Parker, accompanied by several El Paso stockholders, has just returned from an inspection trip to the company's mines in the western part of the State. It is anticipated that work on a larger scale will be inaugurated.

Barranca de Cobre—The concentrating plant at this property in the Urique district is now in operation. Martin Nesbitt and A. E. Mendoza have a long-time lease on both the mine and mill and are planning improvements to make possible an increased output.

International Gold Mines Company—It is expected that the mill building will be in readiness for operation by Sept. 1. In the meantime, mine developments are being vigorously prosecuted under the supervision of manager J. W. Pender. The property is in the Sahuayacan section reached from Ocampo.

Southern Mining Company—This company's new mill is to be placed in commission shortly, according to a recent statement of manager S. H. Worrell.

SONORA

Fundicion Copper Smeltery—The first shipment of matte from this plant started for New York on June 10. It was consigned to the Nichols Copper Company.

Africa

TRANSVAAL

Production of ores and minerals, other than gold ore, for the four months ended April 30 is valued as follows: Copper ore, £6052; galena, £8330; tin ore, £23,734; magnesite, £132; flint, £2700; lime, £17,361; miscellaneous, £6300. The tin-ore output shows a large increase.

Coal mined for the four months was 338,799 tons, from 29 pits. The coal sold was 243,330 tons, the average price at mine being $1.27 per ton.

New Caledonia

Exports of minerals from the Colony for the three months ended March 31 were as follows, in metric tons:

	March.	Three Mos.
Nickel ore	3,018	24,518
Cobalt ore	341	1,030
Chrome ore	1,681	5,892

Exports have been light this year. Only one cargo of nickel ore was shipped in March.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, June 24—In the West the coal trade continues to be generally quiet, with few indications of revival. The Lake trade is gradually opening, but is not yet on a large scale, and June shipments will be light. The lack of returning ore boats is the chief cause of delay in shipments.

In the East also bituminous trade is quiet, and the restricted demand for steam coal is the principal feature. The anthracite trade has developed no conditions requiring special note. There has been some suspension of work at collieries, but the movement is not general. The coastwise trade is dull, buyers postponing the securing of supplies as long as possible.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to June 13, in short tons:

	1907.	1908.	Changes.
Anthracite.....	2,586,235	2,469,413	D. 116,822
Bituminous.....	17,251,031	14,419,474	D. 2,831,557
Coke.....	6,417,488	3,051,632	D. 3,365,856
Total.....	26,254,754	19,940,519	D. 6,314,235

Total decrease this year to date was 24.1 per cent.

Coastwise shipments of coal from chief Atlantic ports, as reported by Bureau of Statistics, four months ended April 30, long tons:

	Anthracite.	Bitum.	Total.	PerCt.
New York....	5,381,707	3,273,031	8,654,738	64.7
Philadelphia	743,888	1,472,212	2,216,100	16.5
Baltimore....	82,832	1,210,013	1,292,845	9.7
Newp't News	.....	806,973	806,973	6.0
Norfolk.....	.....	405,338	405,338	3.1
Total.....	6,208,427	7,167,567	13,375,994	100.0
Total, 1907.	6,393,351	7,344,607	13,737,958	.....

Total decrease this year, 301,964 tons, or 2.6 per cent. New York includes all the New York harbor shipping ports.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, four months ended April 30, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio.....	6,598,063	856,137	7,454,200
Buff., Roch. & Pitts.	1,866,681	135,814	2,002,495
Penn. lines, N. Y. C.	2,167,338	23,738	2,191,076
Pitts. & L. Erie.....	1,968,002	842,226	2,810,228
Norfolk & Western.	3,054,400	602,829	3,657,229
Total.....	15,654,484	2,460,744	18,115,228
Total, 1907.....	20,124,672	4,798,442	24,923,114

In addition the Baltimore & Ohio carried 375,689 tons anthracite in 1907 and 281,493 in 1908; decrease, 94,196 tons.

Coal receipts at St. Louis four months ended April 30 were 2,516,016 short tons in 1907, and 2,374,541 in 1908; decrease, 141,475 tons.

Coal tonnage of roads in Ohio Coal Traffic Association, four months ended April 30, short tons:

	1907.	1908.	Changes.
Hocking Valley.....	1,102,640	741,635	D. 361,005
Toledo & Ohio Cent..	547,676	306,283	D. 241,393
Baltimore & Ohio ...	671,132	537,275	D. 133,857
Wheeling & L. Erie..	1,109,278	784,542	D. 324,736
Cleve., Lorain & Wh.	823,136	755,525	D. 67,611
Zanesville & Western	488,661	373,305	D. 115,356
Toledo Div., Pen. Co.	854,320	550,890	D. 303,430
L. Erie, Alliance & Wh.	383,393	328,427	D. 54,966
Marietta, Col. & Clev.	6,040	22,399	I. 16,359
Total.....	5,986,276	4,400,281	D. 1,585,995

Total decrease this year was 26.5 per cent.

New York

Anthracite

June 24—The market for both prepared and small steam sizes is dull, and little business is being done. The Lake traffic is beginning to start and it is expected that the volume of business will be large owing to the lateness of the season. There has been considerable cutting of prices for all sizes but the principal producers still maintain their regular schedule.

Prices are as follows: Broken, $4.45; egg, stove and chestnut, $4.70; pea $3.25 @3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.65@2; barley, $1.35@1.50; all f.o.b. New York harbor.

Bituminous

The demand for soft coal seems to be improving in the far East and along the Sound. In New York harbor the trade is dull and good grades of steam coal fetch $2.45@2.55. There seems to be a tendency on the part of consumers to contract for coal, in some cases for the balance of the year. Consumers are realizing that coal is cheap at the present freight rates and there is a desire to take advantage of these reductions.

Transportation from mines to tide is fairly good, cars taking about a week to run through. In the Coastwise vessel trade small vessels are scarce in Philadelphia, but plentiful in New York. Large craft are in good supply. Freight rates are as follows from Philadelphia; To Boston, Salem and Portland, 50@55c.; Lynn, 55@60c.; Newburyport, 75c.; Portsmouth, 55@60c.; Saco, 90c.; Bath, 60@65c.; Gardiner, 65c.; Bangor, 70@75c.; to the Sound, 45@50c. Towages where usual.

Birmingham

June 22—Coal production in Alabama is larger than it has been. There has been some disagreement brewing between the commercial coal operators and the union miners, the operators asking that they be placed on the same basis with the non-union mines and while there is hope that a settlement of some sort may be accomplished before July 1, the operators assert that they will not recognize the union if they are not given concessions so as to meet the same competition of the mines where union men are not employed. The Tennessee Coal, Iron and Railroad Company has almost all of its mines in operation throughout the Birmingham district and is using its own coal. Coke is in better demand and the production is improving.

Chicago

June 22—Both western and eastern coals continue to find good sales, though there has been considerable demurrage coal on tracks in the last week. The demand for fine coals is strong, steam-coal users generally turning to fine sorts for summer use. Prices remain fairly firm though they could easily be demoralized by too great shipments.

Illinois and Indiana lump and egg sell lightly at $1.75@2.25; run-of-mine, $1.65 @1.75; screenings, $1.40@1.60. Brazil block has sold at $2.10 with demand fair, but shipments large.

Eastern coals suffer from the favor shown by consumers to fine coals. Smokeless and Hocking are 15 or 25c. under circular prices on many sales. Youghiogheny is moving chiefly on contracts. Anthracite in general is moving slowly, but country sales are improving.

Pittsburg

June 23—While production at the railroad coal mines has been increased to about 90 per cent. of capacity there has been no material improvement. Prices on contract remain firm on the basis of $1.15 for mine-run coal at the mine, but slack is weaker, sales having been made at 70c. and lower. Heavy shipments to Lake ports for the northwestern markets continue. The river coal mines continue to operate almost to capacity.

Connellsville Coke—The coke business shows some improvement, due to the starting and preparing to start of blast furnaces. So far this month contracts have been placed for over 200,000 tons of furnace and 100,000 tons of foundry coke for delivery in the last half. Prices remain unchanged, furnace coke being quoted at $1.65@1.75 and foundry at $2.10@2.25 at oven. The *Courier* gives

the production in both fields at 162,947 tons. The shipments were 5912 cars as follows: To Pittsburg, 2163; to points west of Connellsville, 3206; to points east of Connellsville, 443 cars.

Foreign Coal Trade

British Coal Exports—Exports of fuel from Great Britain, with coal furnished for use of steamships in foreign trade, were as follows, for the five months ended May 31, long tons:

	1907.	1908.	Changes.
Coal	24,354,681	24,976,176	I. 621,495
Coke	354,333	436,765	I. 82,432
Briquets	573,885	611,838	I. 37,953
Total exports	25,282,899	26,024,779	I. 741,880
Steamer coal	7,592,875	7,952,461	I. 359,586
Total	32,875,774	33,977,240	I. 1,101,466

Exports to the United States, included above, were 5162 tons in 1908; a decrease of 17,829 tons from last year.

Welsh Coal Trade—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices at Welsh ports as follows, under date of June 13: Best Welsh steam, $3.90; seconds, $3.66; thirds, $3.54; dry coals, $3.84; best Monmouthshire, $3.36; seconds, $3.30; best small steam, $2.28; seconds, $2.10. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, June 24—The market is still in an uncertain condition. There has been some buying of pig iron in the East, but of rather a spasmodic character. Southern ironmakers, having cleared off accumulated stocks, have become firmer in their views, and will not go below $12.50 Birmingham for No. 2 foundry, as a rule. Sales of Southern were large on the recent activity, some of them running over the year in delivery.

A meeting of the Eastern Bar Iron Association was held in New York, June 18, at which no definite action was taken as to prices, leaving the bar-iron market practically an open one. The selling has been good, but not heavy, as about all the large yearly contracts have been closed. In structural material there has been some buying, but many contracts are being held back, in the expectation of a further drop in prices. In other finished material, business has been light.

Canadian Rail Purchases—The Canadian minister of the interior announces that the five sections of the new Canadian Trans-continental railway now under construction, will require 267,840 tons of steel rails. Of this total, 230,371 have been purchased from the Dominion Iron and Steel Company, Sydney, N. S.; the Algoma Iron and Steel Company, Sault Ste. Marie; and the United States Steel Corporation.

Baltimore

June 23—Exports for the week included 2602 tons steel rails, 326 tons rail fastenings and 1818 tons tie-plates, to Peru. There was also exported 30,023 lb. spelter to Hamburg, Germany.

Birmingham

June 22—Southern pig-iron manufacturers are not urging another advance in the quotations. The prices now obtained range between $12 and $12.50 per ton, No. 2 foundry. The furnaces in operation in the Southern territory are doing well and the probable make for some time to come has been sold. The shipments are lively. There is a larger amount of iron being melted in the South, the cast-iron pipe plants in particular working almost to full capacity.

E. E. Linthicum has secured financial support and will erect another large cast-iron pipe plant at Anniston, Ala. It is announced authoritatively that Pittsburg people will erect a large fire brick works in the western part of Jefferson county, while bridge works will be placed near Bessemer. George W. Connors, of Atlanta, has bought the rolling mill at Helena, 17 miles south of Birmingham, and will convert it into a hoop and cotton-tie mill.

Chicago

June 22—The pig-iron market continues firm with sales individually small, but increasing in number. Prices are apparently holding to $12 Birmingham for Southern No. 2 ($16.35 Chicago), and $17.50 for Northern No. 2.

Buying is for the third and fourth quarters, with most of it required in the third. The political excitement of the week distracted many buyers.

Iron and steel products are dull. Lake Superior charcoal is in fair demand at $19.50. Coke is stronger, but there is much on track. The price of first-class Connellsville remains $4.90 Chicago.

Philadelphia

June 24—The main feature in the eastern and middle Pennsylvania pig-iron situation today is that the accumulation of iron which has been such a depressing factor for months is steadily disappearing. Local consumers are buying sparingly, the chief distribution being in Eastern markets. No. 2 averages $16, though less money is snatched at. Forge is inactive. Some special brands are selling to a small extent for fourth quarter delivery, but all other kinds are limited to third quarter.

Steel Billets—There has been a good deal of see-sawing in negotiations for delivery during the last six months. The present halting is altogether on price.

Bars—The general concessions on bars have not brought out expected business. Nearly all demand is for immediate needs. The car builders are not buying.

Sheets—Business has quieted down again. The large consumers have ordered all they want for the present. Yet there is business all the time both at store and mill.

Pipes and Tubes—There is no sign of life yet. The locomotive people are buying nothing.

Plates—This territory would make a moderate amount of businss for the plate mills if the holding-back customers were not suspicious that conditions will force another drop. A little shipyard work went to mills this week.

Structural Material—Large building operations are backward. Prices are weak. The big mills are booking very little business. The Western independents are reaching their claws into this territory and they seem to soak up about all the business going.

Old Material—Scrap dealers are not counting on any improvement just now. The only scrap they take interest in is railroad, and that they are willing to buy and hold.

Pittsburg

There is a much better tone in the steel market this week and indications point to a gradual improvement. It was conservatively estimated today by one of the large producing concerns that since the cut in the price of steel bars, contracts have been closed aggregating fully 400,000 tons. Of this tonnage 250,000 tons were taken up by the agricultural implement makers. In other finished lines the reductions have not brought out large tonnages, although a considerable number of small orders have been booked. Additional mills have been put on at the Homestead works of the Carnegie Steel Company and also at the plant of the Jones & Laughlin Steel Company. In the Youngstown district the Republic Iron and Steel Company has operated its bessemer steel plant for three consecutive weeks and it will be kept going until the end of the month. The Valley and the Brown-Bonnell plants are running practically full. The leading pipe interest reports that orders continue to come in, although no large tonnages are being booked. In wire products trade shows a slight increase.

The wage conference between representatives of the Amalgamated Association and the Republic Iron and Steel Company ended without a settlement. The present scale expires on June 30. The workers asked for a continuance of this scale, but were willing to make concessions. The Republic proposed a radical reduction which the workers would not consider. It is evident the Republic intends to ignore organized labor and operate its plants on the open-shop plan after July 1.

Pig Iron—The only sale of importance was 1000 tons of basic for delivery in the Pittsburg district at $15.30. Valley, de-

liveries to run over the last five months of the year. Quotations this week are: Bessemer, $16@16.25; malleable bessemer, $15.25@15.50; basic, $15.25@15.50; No. 2 foundry, $15@15.25; gray forge, $14 @14.25, all at Valley furnaces.

Steel—There has been no buying of billets of any consequence. Steel bars are strong at 1.40c. and plates at 1.60c.

Sheets—Black sheets are still quoted at 2.50c. and galvanized at 3.55c. for No. 28 gage.

Foreign Iron Trade

German Iron Production—The German Iron and Steel Union reports pig-iron production in Germany in April at 979,866 metric tons, a decrease of 67,132 tons from March, and of 81,463 tons from January. For the four months ended April 30 the totals were, in metric tons:

	1907.	1908.	Changes.
Foundry iron	729,268	774,913	I. 45,645
Forge iron.....	267,595	239,384	D. 28,211
Steel pig.....	338,879	351,671	I. 12,792
Bessemer pig.....	161,415	146,956	D. 14,459
Thomas pig.....	2,720,146	2,569,455	D. 150,691
Total.....	4,217,303	4,082,379	D. 134,924

There were gains in foundry iron and in steel pig, which includes spiegeleisen, ferro-manganese, ferro-silicon and all similar alloys; losses in forge iron, in bessemer pig and in Thomas, or basic pig. The total decrease was 3.2 per cent.

Metal Market

Gold and Silver Exports and Imports
NEW YORK, June 24.
At all U. S. Ports in May and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
May 1908..	$26,555,913	$ 3,069,402	Exp. $23,486,511
" 1907..	4,505,444	2,682,163	" 1,823,281
Year 1908..	44,891,257	22,926,623	" 21,964,634
" 1907..	12,428,592	19,303,305	Imp. 6,874,713
Silver:			
May 1908..	4,028,334	3,362,176	Exp. 666,158
" 1907..	4,326,216	3,563,096	" 763,120
Year 1908..	21,077,185	17,660,758	" 3,416,427
" 1907..	23,858,610	18,919,065	" 4,939,545

Exports from the port of New York, week ended June 20: Gold, $4,134,500, chiefly to France and Germany; silver, $687,907, chiefly to London. Imports: Gold, $660,422, from France, Haiti and Mexico; silver, $149,046, from Central and South America.

Specie holdings of the leading banks of the world June 20, are reported, as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	.....	.....	$312,117,300
England.....	$194,320,860	.....	194,320,160
France.....	626,088,480	$183,836,095	809,924,575
Germany.....	191,835,000	79,500,000	271,335,000
Spain.....	78,025,000	133,510,000	211,535,000
Netherlands....	38,510,000	21,041,500	59,551,500
Belgium.....	20,513,335	10,256,665	30,770,000
Italy.....	181,160,000	21,500,000	202,660,000
Russia.....	559,860,000	38,090,000	597,950,000
Aust.-Hungary.	234,000,000	66,695,000	300,695,000
Sweden.....	19,435,000	.....	19,435,000
Norway.....	7,540,000	.....	7,540,000
Switzerland....	17,965,000	.....	17,965,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Gold and silver movement in Great Britain, five months ended May 31:

	Imports.	Exports.	Excess.
Gold.....	£20,065,895	£15,904,504	Imp.£ 4,161,391
Gold, 1907...	21,265,381	13,740,864	Imp. 7,524,517
Silver.....	4,092,767	5,478,303	Exp. 1,385,536
Silver, 1907.	7,886,541	7,913,492	Exp. 26,951

Gold and silver movement in France, four months ended April 30:

	Imports.	Exports.	Excess.
Gold....	Fr.230,164,000	Fr.9,318,000	Imp.Fr.220,846,000
1907...	53,228,000	72,316,000	Exp. 19,088,000
Silver..	45,662,000	61,480,000	Exp. 15,818,000
1907...	50,523,000	47,827,000	Imp. 2,696,000

Imports of nickel and copper coins, 32,000 fr. in 1907 and 27,000 fr. in 1908; exports, 125,000 fr. in 1907, and 305,000 fr. this year.

Silver Market

SILVER AND STERLING EXCHANGE.

June.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	June.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
18	4.8710	54⅜	25 1/16	22	4.8700	54½	25⅛
19	4.8705	54⅜	25⅛	23	4.8700	55⅛	25⅝
20	4.8690	54¼	25 1/16	24	4.8690	54⅝	25 3/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to June 11:

	1907.	1908.	Changes.
India.....	£5,656,544	£3,698,158	D. £1,958,386
China.	.....	516,400	I. 516,400
Straits.....	505,362	90,510	D. 414,852
Total.. ...	£6,161,906	£4,305,068	D. £1,856,838

Imports for the week were £174,000 from New York. Exports were £114,100 to India.

Silver has shown some improvement, owing to better advices from India; and while the future is uncertain, a decline to the prices prevailing some weeks ago is not likely.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS.

June.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
18	12⅞ @13	12⅝ @12⅞	58⅛	28	4.47½ @4.52½	4.50 @4.55	4.35 @4.40
19	12⅞ @13	12⅝ @12⅞	58¼	28⅛	4.47½ @4.52½	4.50 @4.55	4.35 @4.40
20	12⅞ @13	12⅝ @12⅞	.....	28	4.47½ @4.52½	4.50 @4.55	4.35 @4.40
22	12⅞ @13	12⅝ @12⅞	58⅛	27¾	4.47½ @4.52½	4.50 @4.55	4.35 @4.40
23	12⅞ @13	12⅝ @12⅞	58	27¾	4.47½ @4 52½	4.50 @4.55	4.35 @4.40
24	12⅞ @13	12⅝ @12⅞	57¾	27¼	4.47½ @4.52½	4.50 @4.55	4.35 @4.40

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electroytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The buying for domestic and foreign account which was reported last week and previously has apparently satisfied the demand for the time being, and during the week of June 18-24 business has practically been at a standstill. As producers are not pressing their output for sale, the market closes unchanged and nominal at 12⅞@13c. for Lake copper; 12⅝@12⅞c. for electrolytic in ingots, cakes and wirebars. The average of the week for casting copper is 12⅜@12½ cents.

Reports from London are to the effect that speculation has died out. Transactions have shrunk from day to day, and at the close the market has become so narrow that what little copper has been pressed for sale has made a decided impression, quotations declining to £57 7s. 6d. for spot, £58 2s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £60 10s.@£61 10s.; best selected, £60 10s.@£61 10s.; strong sheets, £72 10s.@£73 10s.

It is reported that the Nevada Consolidated and Cumberland-Ely companies have made a contract with the American Smelting and Refining Company for the refining of their copper. As yet no contract has been made for the sale of the copper, but it is believed that this will be done by the American Smelting and Refining Company.

Manufactured Copper—Sheets, cold-rolled, 18c.; hot-rolled, 17c. Wire, 14¾c. base.

Tin—The London market has shown a very soft tone throughout the week and declined continuously. The close is cabled at £125 10s. for spot, £126 5s. for three months.

The domestic market has been absolutely lifeless and the transactions that were consummated took place among dealers, while consumers show no interest whatsoever in the article. At the close spot tin can be bought at about 27¼c. per lb., New York.

Arrivals of Bolivian tin ores and concentrates in Europe, reduced to fine tin, for the five months ended May 31, were 6597 tons in 1907, and 7168 tons in 1908; increase, 571 tons.

Lead—The market is dull and unchanged at 4.47½@4.52½c. New York.

The London market is holding its own fairly well, the close being cabled at £12 15s. for Spanish lead, £12 17s. 6d. for English lead.

Spelter—The continued absence of demand is getting on the nerves of holders

of the metal and offerings have been on a more liberal scale and at lower prices. The close is weak at 4.35@4.40c. St. Louis, 4.50@4.55c. New York.

The London market is also weak, having declined at the close to £18 15s. for good ordinaries, £19 for specials.

Zinc Sheets—Base price is 7c., f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—The situation is unchanged. Quotations are 8⅝@8¾c. for Cookson's, 8½@8⅝c. for Hallett's and 8@8⅛c. for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base. Foreign metal is offered at rather lower prices.

Cadmium—In 100-lb. lots, $1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 45@50c., New York.

Quicksilver—New York price is $44 per flask for large lots; $45 for jobbing orders. San Francisco, large lots nominal at $43.50, domestic, and $42, export; small orders, $45@46. London is lower at £8 per flask, with 2s. 6d. less quoted by second hands.

Platinum—The demand is better, and inquiries for fairly large quantities have been received. While this has not yet affected prices it is believed, in the trade, that the market will stiffen. Quotations are $23.50 per oz. for hard platinum, $21 for ordinary and $16 for scrap.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, five months ended May 31, figures in long tons, except quicksilver, which is in pounds:

Copper:	Imports.	Exports.	Excess.
Copper ore	49,288	.....	.....
Matte, etc.	31,903	.....	.....
Fine copper	44,056	.....	.....
Total copper	64,937	22,015	Imp. 42,922
Total, 1907	46,658	23,002	Imp. 23,656
Tin:			
Straits	15,761	.....	.....
Other	2,863	.....	.....
Total	18,624	13,886	Imp. 4,738
Total, 1907	17,555	11,798	Imp. 5,757
Lead:			
United States	16,932	.....	.....
Spain	43,578	.....	.....
Other	38,688	.....	.....
Total	99,198	23,488	Imp. 75,710
Total, 1907	81,985	22,411	Imp. 59,574
Spelter:			
Spelter	37,509	.....	.....
Zinc sheets, etc.	7,299	.....	.....
Total	44,808	3,262	Imp. 41,546
Total, 1907	47,599	2,125	Imp. 45,474
Quicksilver, lb.	2,129,377	754,565	Imp. 1,374,812
Quicksilv'r, 1907	2,768,636	1,049,251	Imp. 1,719,385

Copper totals give estimated contents of all materials in fine copper. Tin-ore imports, not given above, were 8340 tons in 1907, and 10,327 tons in 1908; increase, 1987 tons. Imports of iron and copper pyrites were 342,052 tons in 1907, and 366,162 in 1908; increase, 24,110 tons.

Missouri Ore Market

Joplin, Mo., June 20—The highest price paid for zinc ore was $37 per ton, the base ranging from $31 to $35 per ton of 60 per cent. zinc, and the average price, all grades, being $31.92, a large amount of low-per cent. ore being marketed during the week. The highest price for lead ore was $62.50 for this week's delivery, medium grades selling at $61@62, and all grades averaging $61.02 per ton.

The competition for zinc ore the past week is best exemplified in the statement that eight bids were made on one bin of ore, on which there were only three bids the previous week. The delivery of lead at $62.50 was on a purchase made at the end of last week, and one sale of 350 tons was made at the end of this week, for next week's delivery, at $64 per ton in the bin, or $64.50 f.o.b. This purchase was made by the St. Louis Smelting and Refining Company, against the high price at the end of last week made by the Picher Lead Company.

Following are the shipments from the various camps for the week ending June 20:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	2,342,570	1,160,350	$72,890
Joplin	2,143,940	271,940	44,205
Galena	814,220	147,520	17,527
Duenweg	913,170	34,650	15,998
Miami	599,010	236,770	15,687
Prosperity	372,600	139,460	10,223
Badger	467,310	41,060	9,196
Alba-Neck	446,820	.....	7,818
Granby	181,150	25,000	3,075
Aurora	192,760	.....	2,307
Oronogo	123,100	.....	2,101
Spurgeon	121,560	25,340	1,844
Carthage	97,460	.....	1,635
Cave Springs	65,820	.....	1,096
Sarcoxie	63,950	.....	1,023
Totals	8,947,440	2,082,090	$206,625
25 weeks	229,995,490	35,109,930	$4,850,969

Zinc value, the week, $142,806; 25 weeks, $3,924,810
Lead value, the week, 63,819; 25 weeks, 926,159

Average ore prices in the Joplin market were, by months:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1907.	1908.	Month.	1907.	1908.
January	45.84	35.56	January	83.58	46.88
February	47.11	34.92	February	84.58	49.72
March	48.66	34.19	March	82.75	49.90
April	48.24	34.08	April	79.76	52.47
May	45.98	33.39	May	79.56	56.05
June	44.82	.....	June	73.66	.....
July	45.79	.....	July	58.18	.....
August	43.22	.....	August	59.54	.....
September	40.11	.....	September	53.52	.....
October	39.83	.....	October	51.40	.....
November	35.19	.....	November	43.40	.....
December	30.87	.....	December	37.71	.....
Year	43.68	.....	Year	68.90	.....

Wisconsin Ore Market

Platteville, Wis., June 20—Highest price paid for zinc ore this week was $35, on a basis of $32@33 per ton of 60 per cent. zinc. Lead ore sold as high as $62 per ton.

Several more mines closed down during the week; the St. Rose is now the only active producer in the Platteville camp; the big producers at Hazel Green and Benton, however, continue to make their usual output. The big mine consolidation at Platteville is still held in abeyance, but is expected to be consummated by the latter part of the month, when work in these mines will be resumed.

Shipments from district for week ended June 20:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	375,200	50,000	131,800
Benton	261,400	80,000	.....
Livingston	220,000	.....	.....
Days Siding	178,100	.....	.....
Cuba City	167,080	168,290	.....
Dodgeville	150,000	8 ,000	.....
Elmo	86,540	.....	.....
Highland	71,800	101,100	.....
Harker	65,370	66,780	.....
Linden	53,070	.....	.....
Total	1,628,560	546,170	131,800
Year to June 20	40,490,085	4,514,375	314,330

Strawbridge shipped 335,900 lb. of zinc concentrates, of which 119,500 lb. was sent to Hazel Green to be roasted, 150,000 to the Enterprise roaster at Platteville, and the balance to the electrostatic separator at Platteville. There was also shipped to the electrostatic separator from Benton, 296,600 lb.; from Linden, 96,500 lb.; and from Cuba City, 59,300 lb. zinc ore. Received at the Joplin Separator Works, at Galena, from Benton, 110,000 lb., and from Highland, 45,400 lb. zinc ore.

Chemicals

New York, June 24—The market is listless and void of all speculative features. Dealers look for no improvement until the fall business begins.

Copper Sulphate—A fair demand is reported and prices are firm. Price cutting is not in evidence and quotations remain at $4.65 per 100 lb. for carloads and $4.90 for smaller lots.

Nitrate of Soda—The market is quiet, but dealers do not report weakness. The demand is fair. Quotations are 2.32½c. for spot and 2.30c. for the balance of 1908.

Phosphate Rock—P. C. Trenholm reports shipments of phosphate rock from Charleston, S. C., in May at 5760 tons by rail.

Mining Stocks

New York, June 24—The general stock market has been irregular and quotations have been rather heavy. While there has been nothing of a nature calculated to depress prices, there have been only spasmodic rallies, with later reactions and, apparently rather a downward tendency. Selling rather than buying seems to be the order, with the public not largely interested.

The curb market was dull, so far as mining stocks were concerned. The copper shares were not much in demand, and other mining issues were traded in only on a moderate scale. Hot weather seemed to have induced a period of summer dulness.

Boston

June 23—There has been little of moment in this market during the week, and prices as a rule are generally off from a week ago. A spurt in Adventure mining has been the only feature. This stock rose from $1.62½ to $4.12½ on buying which came largely from the Lake district. Mining operations have been suspended at the property although drilling has exposed a lode which looks like the Lake lode and gave a favorable opportunity for a speculative movement with comparatively large trading in it. The close tonight was $3.37½, so that the advance has held fairly well.

Amalgamated has gone off $3 to $65; Copper Range $1.75 to $71.50; Greene Cananea $1 to $10.12½; Mohawk $3 to $58.50 ex-dividend. United States Smelting fell off $2.25 to $35.75. Wm. B. Leeds, who died abroad today, is said to be a holder of this stock to the extent of 20,000 shares.

As yet no plan of reorganization has been agreed upon for the Davis-Daly Estates Copper Company.

The curb has been featureless, with mining stocks generally lower for the week.

STOCK QUOTATIONS

NEW YORK June 23	
Name of Comp.	Clg.
Alaska Mine	5/16
Amalgamated	65¼
Anaconda	40½
Balaklala	‡1
British Col. Cop.	4¼
Butte & London	....
Butte Coalition	22
Colonial Silver	‡1½
Cum. Ely Mining	7⅜
Davis Daly	1⅜
Dominion Cop	1⅜
Douglas Copper	3⅛
El Rayo	2
Florence	3⅛
Foster Cobalt	60
Furnace Creek	.14
Giroux	3⅜
Gold Hill	⅛
Goldfield Con	5¼
Granby	96¼
Greene Gold	⅛
Greene G. & S	5/16
Greenw'r & D.Val.	.75
Guanajuato	2¼
Guggen. Exp.	150
Hanapah	‡.20
McKinley Dar.	79
Micmac	2⅞
Mines Co. of Am.	1½
Mitchell Mining	‡½
Mont. Sho.C	¾
Nev. Utah M. & S	3
Newhouse M. & S	‡6¼
Nipissing Mines	7¾
Old Hundred	½
Silver Queen	1.08
Stewart	⅛
Tennessee Cop'r.	‡36⅛
Tri-Bullion	1⅛
Union Copper	‡¾
Utah Apex	4⅛
Utah Copper	31
Yukon Gold	3½

BOSTON June 23	
Name of Comp.	Clg.
Adventure	3⅜
Allouez	28
Am. Zinc	‡27½
Arcadian	3⅝
Arizona Com	17½
Atlantic	15¼
Bingham	.70
Boston Con	11⅜
Calumet & Ariz	108
Calumet & Hecla	660
Centennial	23½
Con. Mercur	.44
Copper Range	71¼
Daly West	10¾
Franklin	9⅛
Greene—Can	10⅛
Isle Royal	18
La Salle	14
Mass	4⅞
Michigan	9½
Mohawk	59
Nevada	11½
North Butte	65⅝
Old Colony	‡.50
Old Dominion	34⅜
Osceola	92
Parrot	22
Quincy	84⅛
Rhode Island	3¼
Santa Fe	1⅞
Shannon	13⅛
Superior	17
Tamarack	57½
Trinity	12¾
United Cop., com.	‡7
U. S. Oil	24¾
U. S. Smg. & Ref.	35¾
U.S.Sm. & Re.,pd.	42
Utah Con	40¼
Victoria	4¾
Winona	5
Wolverine	133
Wyandotte	1½

*Ex. Div. †Ex. Rights. ‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	23⅝
Am. Smelt. & Ref.	74¾
Am. Sm. & Ref., pf.	99⅝
Bethlehem Steel	‡15
Colo. Fuel & Iron	25⅜
Federal M. & S.,pf.	‡74½
Inter. Salt	18½
National Lead	64⅜
National Lead, pf.	‡99¾
Pittsburg Coal	‡12
Republic I. & S.	16½
Republic I.& S.,pf.	63⅛
Sloss-Sheffield	‡50
Standard Oil	600
U. S. Red. & Ref.	‡10
U. S. Steel	36½
U. S. Steel, pf	101⅜
Va. Car. Chem	22½

BOSTON CURB	
Ahmeek	‡71
Black Mt	3¼
East Butte	‡6
Hancock Con	4¾
Keweenaw	5⅝
Majestic	.57
Raven	1
Shawmut	.33
Superior & Pitts	12¼
Troy Man	‡.40

ST. LOUIS June 20		
N. of Com.	High.	Low.
Adams	.30	.20
Am. Nettie	.04	.03
Center Cr'k	2.00	1.50
Cent. C. & C.	70.00	68.00
C.C. & C. pd.	77.00	75.00
Cent. Oil	110 00	100.00
Columbia	4.00	3.00
Con. Coal	18.00	16.00
Doe Run	120.00	110.00
Gra. Bimet.	.20	.15
St. Joe	15.00	12.50

LONDON June 24			
Name of Com.	Clg.		
	£1	5s	0d
Dolores	0	1	6
Stratton'sInd.	0	13	0
Camp Bird	1	7	6
Esperanza	1	12	6
Tomboy	1	5	7½
El Oro	0	10	7½
Oroville			

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. June 21.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick	.13
Belcher	.20	St. Ives	.25
Best & Belcher	.40	Triangle	.03
Caledonia	.06	BULLFROG STOCKS	
Challar	.05	Bullfrog Mining	.03
Comstock	...	Bullfrog Nat. B	.04
Con. Cal. & Va	.49	Gibraltar	.04
Crown Point	.24	Gold Bar	.03½
Exchequer	.12	Homestake King	.30
Gould & Curry	.11	Montgomery Mt.	.06
Hale & Norcross	.16	Mont. Shoshone C	.70
Mexican	.35	Original Bullfrog	.01
Ophir	2.40	Tramp Cons	.14
Overman	.06	MANHAT'N STOCKS	
Potosi	.10	Manhattan Cons.	.08
Savage	.23	Manhat'n Dexter	.05
Sierra Nevada	.17	Jumping Jack	.04
Union	.27	Stray Dog	.03
Utah	...	MISCELLANEOUS	
Yellow Jacket	.49	Golden Boulder	.07
TONOPAH STOCKS		Bonnie Clare	.07
Belmont	.82	Lee Gold Grotto	...
Extension	.70	Nevada Hills	1.62½
Golden Anchor	.01½	Nevada Smelting	.75
Jim Butler	.22	Pittsburgh S. Pk.	1.10
MacNamara	.33	Round Mt. Sphinx	.26
Midway	.35		
Montana	1.44		
North Star	.06		
Tono'h Mine of N.	8.12½		
West End Con	.42		
GOLDFI'D STOCKS			
Adams	.03		
Atlanta	.16		
Booth	.15		
Columbia Mt	.13		
Comb. Frac	.50		
Cracker Jack	.04		
Dia'dfield B. B. C.	.15		
Goldfield Belmont	.14		
Goldfield Daisy	.72		
Great Bend	.25		
Jumbo Extension	.30		
Katherine	...		
Kendall	.13		
Lone Star	.06		
May Queen	.06		
Oro	.08		
Red Hill	.18		
Roanoke	...		
Sandstorm	.22		

COLO. SPRINGS June 20	
Name of Comp.	Clg.
Acacia	‡5⅛
Black Bell	....
C. C. Con	‡3¼
Dante	.07
Doctor Jack Pot	‡3½
Elkton	57
El Paso	36⅛
Findlay	‡22
Gold Dollar	‡5¾
Gold Sovereign	‡2¾
Isabella	30⅝
Index	....
Jennie Sample	.03½
Jerry Johnson	....
Mary McKinney	‡23
Pharmacist	‡3¼
Portland	1.06
Un. Gold Mines	‡4½
Vindicator	85
Work	.09

Assessments

Company.	Delinq.	Sale.	Amt.
Birchville, Cal	June 20	July 11	$0.02
Bullion, Nev	June 25	July 17	0.05
Butler-Liberal, Utah	July 17	Aug. 6	0.02
Challar, Nev	July 8	July 30	0.10
Con. Imperial, Nev	June 17	July 9	0.01
Con. Virginia, Nev	June 12	July 3	0.25
Confidence, Nev	June 10	June 30	0.20
Lead King, Utah	July 1	July 28	0.01
Little Chief, Utah	June 17	July 7	0.01
Lucky Dutchman, Nev	June 30	July 20	0.01
Mountain Dell, Utah	June 24	July 13	0.02
N. Y. Bonanza, Utah	June 9	June 30	0.02
Oro Cobre, Cal	July 16	Aug. 3	0.02
Overman, Nev	June 19	July 10	0.05
Peruvian Con., Utah	June 22	July 7	0.01
Silver King Con., Utah	June 11	June 30	0.10
Spanish Ridge, Cal	June 1	July 1	0.05
Tomahawk, Nev	Julp 10	Aug. 12	0.01
Tonopah North Star, Nev	June 24		0.01
Union Con., Nev	June 15	July 9	0.10

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	68.673	55.678	31.769	25.738
February	68.835	56.000	31.852	25.855
March	67.519	55.365	31.325	25.570
April	65.462	54.505	30.253	25.133
May	65.981	52.795	30.471	24.377
June	67.090	.....	30.893	.....
July	68.144	.....	31.366	.....
August	68.745	.....	31.637	.....
September	67.792	.....	31.313	.....
October	62.435	.....	28.863	.....
November	58.677	.....	27.154	.....
December	54.565	.....	25.362	.....
Year	65.327	.....	30.188	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1907.	1908.	1907.	1908.	1907.	1908.
January	24.404	13.726	24.825	13.901	106.739	62 386
February	24.869	12.905	25.236	13.098	107.356	58.786
March	25.065	12.704	25.560	12.875	106.594	58.761
April	24.224	12 743	25.260	12.928	98.625	58.331
May	24.048	12.598	25.072	12.788	102.375	57.387
June	22.665	.....	24.140	.....	97.272	.....
July	21.130	.....	21.923	.....	95.016	.....
August	18.356	.....	19.255	.....	79.679	.....
September	15.565	.....	16.047	.....	68.375	.....
October	13.169	.....	13.551	.....	60.717	.....
November	13.391	.....	13.870	.....	61.226	.....
December	13.163	.....	13.393	.....	60.113	.....
Year	20.004	.....	20.661	.....	87.007	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January	41.548	27.380	July	41.091	.....
February	42.102	28.978	August	37.667	.....
March	41.313	30.577	September	36.689	.....
April	40.938	31.702	October	32.620	.....
May	43.149	30.015	November	30.833	.....
June	42.120	.....	December	27.925	.....
			Av. year	38.166	.....

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January	6.000	3.691	19.828	14.469
February	6.000	3.725	19.531	14.250
March	6.000	3.838	19.703	13.975
April	6.000	3.993	19.975	13.469
May	6.000	4.253	19.688	12.938
June	5.760	.....	20.188	.....
July	5.288	.....	20.350	.....
August	5.250	.....	19.063	.....
September	4.813	.....	19.776	.....
October	4.750	.....	18.531	.....
November	4.376	.....	17.281	.....
December	3.658	.....	14.500	.....
Year	5.325	.....	19.034	.....

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

MONTH.	New York.		St. Louis.		London.	
	1907.	1908.	1907.	1908.	1907.	1908.
January	6.732	4.513	6.582	4.363	27.125	20.563
February	6.814	4.788	6.664	4.638	25.938	20.875
March	6.837	4.665	6.687	4.527	26.094	21.075
April	6.685	4.645	6.535	4.495	25.900	21.344
May	6.441	4.608	6.291	4.458	25.563	19.906
June	6.419	.....	6.269	.....	25.469	.....
July	6.072	.....	5.922	.....	23.850	.....
August	5.701	.....	5.551	.....	21.969	.....
September	5.236	.....	5.086	.....	21.050	.....
October	5.430	.....	5.280	.....	21.781	.....
November	4.925	.....	4.775	.....	21.438	.....
December	4.254	.....	4.104	.....	20.075	.....
Year	5.962	.....	5.812	.....	23.771	.....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

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JUN 27 1908

THE ENGINEERING AND MINING JOURNAL

Vol. 85. 505 Pearl Street, New York. No. 26.

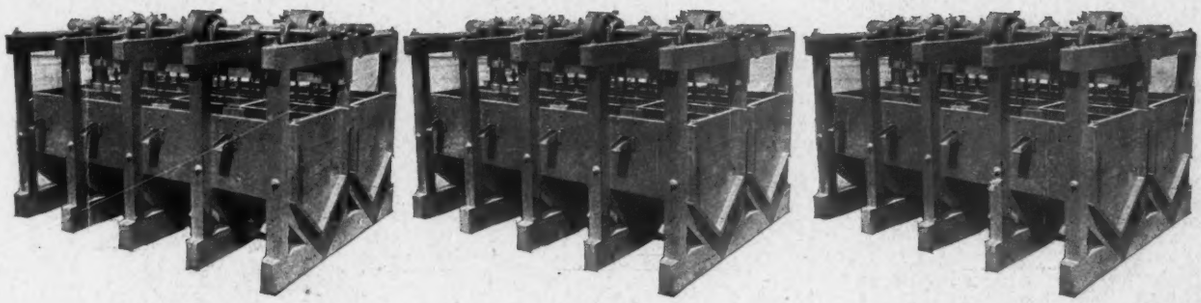
Contents, 1301. Index to Advertisers, 42. Buyers' Directory, 44. Professional Directory, 55.

The Relative Size of the RICHARDS JIG

This is a Single 4-Comp. Richards Pulsator Jig 90 Tons Capacity

And a combination of

Hartz Jigs of Equal Capacity



Both Types of Machine are Photographed to the Same Scale.

COMPARISON
90 TONS PER DAY CAPACITY

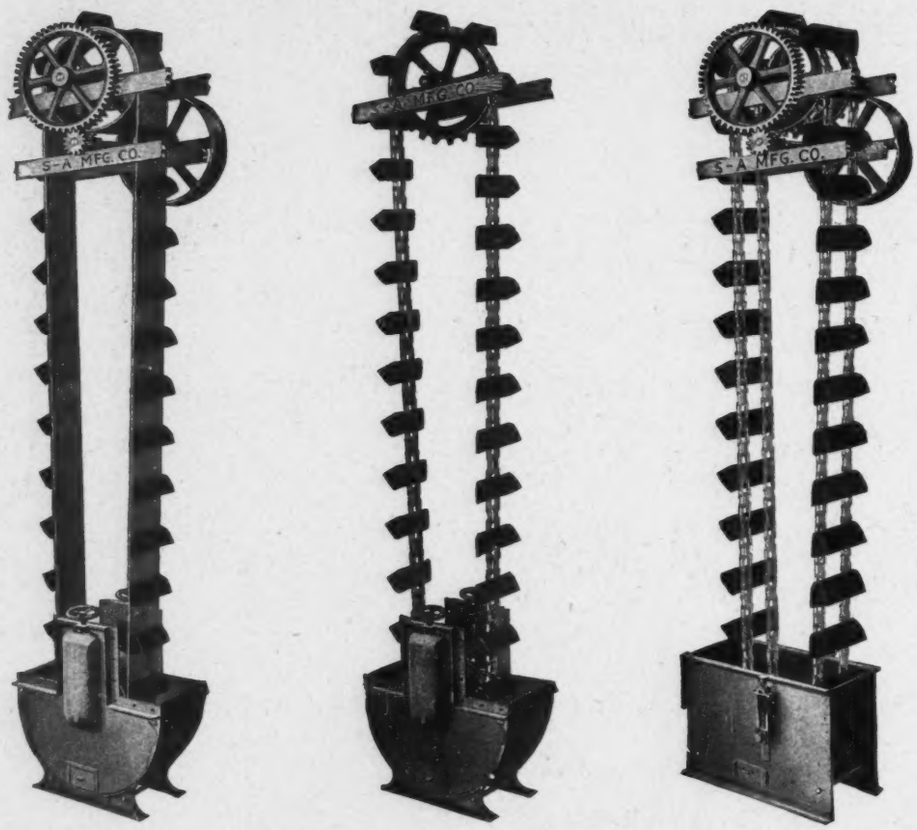
Type of Machine	Richards	Hartz
Floor Space	8 Square Feet	530 Square Ft.
Weight	1700 lbs.	28,000 lbs.
Machines Required	1 Single 4-Compartment	3 Double 4-Compartment
Water	80,000 Gallons	425,000 Gallons
Number of Places to Lubricate	1	60
Power	1¼ H.P.	6 H.P.
Screen Area	64 Square In.	9,000 Square In.

Our claims for the Richard Pulsator Jig, as given above, are proven by results obtained in exhaustive tests under commercial operating conditions at one of the largest copper concentrating mills in the country.

Denver Engineering Works, Denver, Colo., U.S.A.

Stephens-Adamson Mfg. Co.

"S-A" Bucket Elevators.



Our Chain Elevators are made with or without geared heads and with either single or double strands of chains or belts as requirements demand. We make them with buckets of any style or size. They are furnished with special chains of any type or with the standard detachable chains. In ordering these elevators state distance between head and boot shafts, capacity desired per hour and kind of material to be elevated.

Send for our monthly bulletin "Conveying and Transmission."

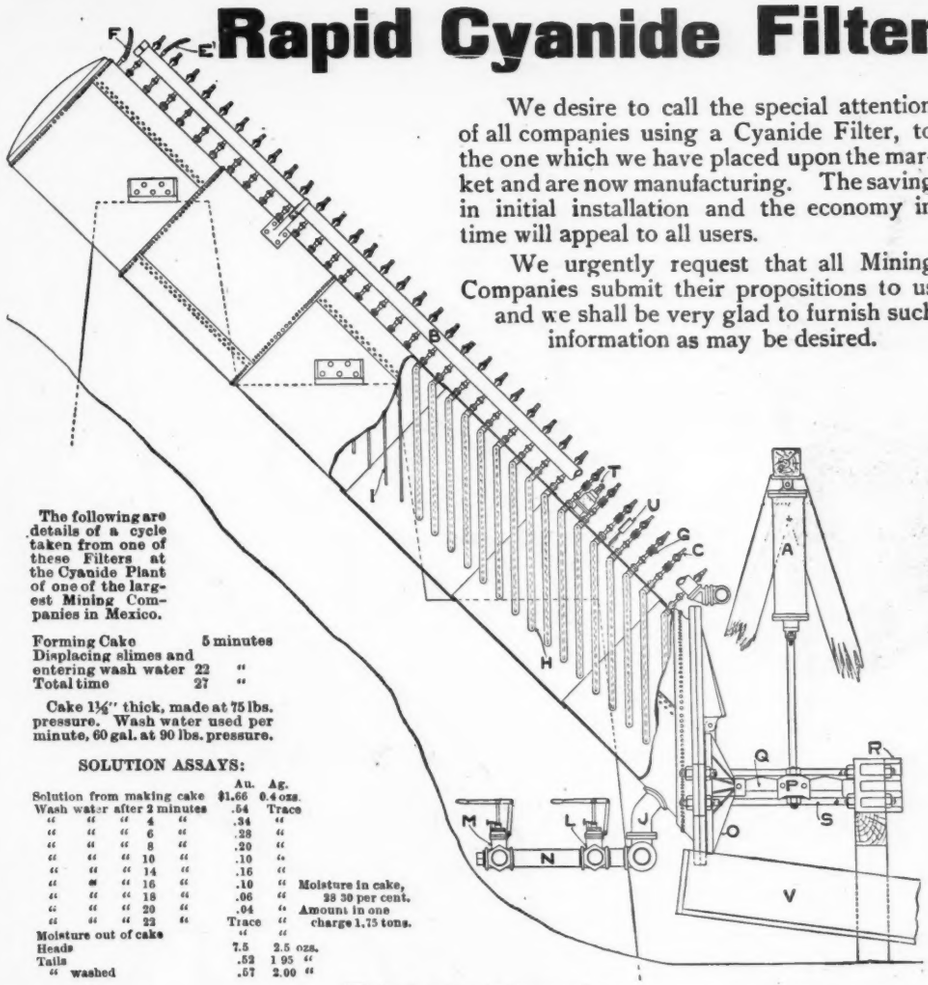
Main Office and Works: Aurora, Ill., U. S. A.

Chicago Office: First National Bank Building. New York Office: 43 Exchange Place.

Mussens Ltd., Canadian Agents, Montreal, Quebec. Hendry & Blue, Pacific Coast Agents, Monadnock Building, San Francisco.
Hallidie Machinery Company, Seattle, Wash., Northwest Agents.

CHALMERS & WILLIAMS

Rapid Cyanide Filter.



We desire to call the special attention of all companies using a Cyanide Filter, to the one which we have placed upon the market and are now manufacturing. The saving in initial installation and the economy in time will appeal to all users.

We urgently request that all Mining Companies submit their propositions to us and we shall be very glad to furnish such information as may be desired.

The following are details of a cycle taken from one of these Filters at the Cyanide Plant of one of the largest Mining Companies in Mexico.

Forming Cake	5 minutes
Displacing slimes and entering wash water	22 "
Total time	27 "

Cake 1½" thick, made at 75 lbs. pressure. Wash water used per minute, 60 gal. at 90 lbs. pressure.

SOLUTION ASSAYS:

	Au.	Ag.
Solution from making cake	$1.66	0.4 ozs.
Wash water after 2 minutes	.54	Trace
" " " 4 "	.34	"
" " " 6 "	.28	"
" " " 8 "	.20	"
" " " 10 "	.10	"
" " " 14 "	.16	"
" " " 16 "	.10	"
" " " 18 "	.06	"
" " " 20 "	.04	"
" " " 22 "	Trace	"
Moisture out of cake	"	"
Heads	7.5	2.5 ozs.
Tails	.52	1 95 "
" washed	.67	2.00 "

Moisture in cake, 28 30 per cent.
Amount in one charge 1.75 tons.

Write for descriptive catalogue.

General Offices, Commercial Nat'l Bank Bldg., Chicago.

New York Office, 120 Liberty Street.

Salt Lake City Office, 201 Dooly Block

San Francisco Agents, Hewitt Machinery Company.

MINING MACHINERY

GENERAL OFFICES - CHICAGO
WORKS - CHICAGO HEIGHTS, ILL.

THE PIONEER MINING MACHINERY HOUSE OF THE WEST.

THE HENDRIE & BOLTHOFF MFG & SUPPLY CO.

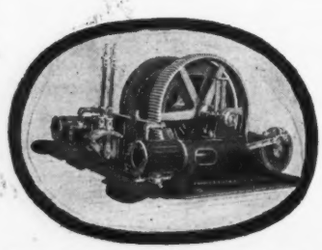
DENVER, COLO.

STEAM ELECTRICAL AND HYDRAULIC ENGINEERING ~ MINE AND SMELTER SUPPLIES.

THE MACHINERY QUESTION

We are better able to answer this question than any other supply house in the West, having in stock all kinds, and countless numbers of sizes and styles of machinery for

IMMEDIATE DELIVERY



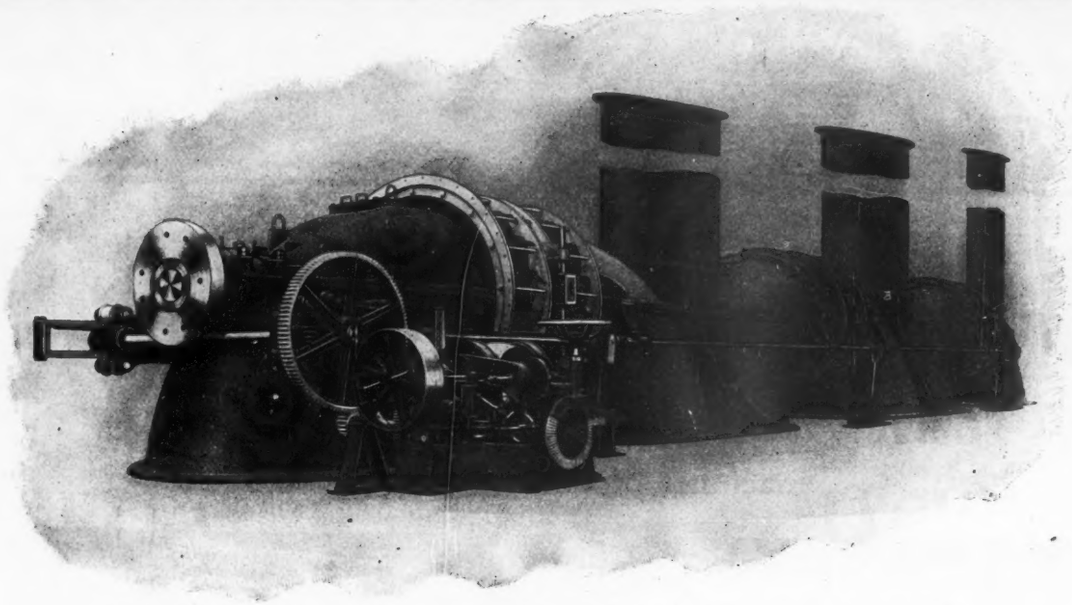
Our Immediate Delivery stock sheet is a wonder. It contains a full list of our stock; also sizes and styles. You should have one. Let us pay the postage on it to you together with any catalog of machinery you might mention.

WRITE TODAY

THE HENDRIE & BOLTHOFF MFG. & SUPPLY CO.,
DENVER, COLO., U. S. A.

THE WELLMAN-SEAVER-MORGAN CO.

WELLMAN-SEAVER-MORGAN ENGINEERING DIVISION — ENGINEERS AND MANUFACTURERS — WEBSTER, CAMP & LANE DIVISION



(Showing one unit of six 54" Turbines Developing 6250 H. P. at 162 R. P. M. under 34-ft. Head.)

WATER POWER EQUIPMENT

OF HIGHEST EFFICIENCY

We build these Turbines in a variety of settings and combinations, to conform to local conditions, among them being the following:

Single vertical setting in iron.
Single horizontal setting in iron.
Double horizontal setting in iron casing with one or two inlets, and one or two discharge openings.
Horizontal setting with any number of wheels on shaft and variable arrangement for discharge.
Double vertical setting with Turbines located above each other.

Inquiries should be accompanied by full details as to head, speed of flow, power required, contour of ground on which plant is to be located, etc.
Let us figure on your requirements.

Recent large installations by us include the power plant of the Chicago Sanitary District, the Lake Superior Power Co.'s Plant at the "Soo," the new plant of the South Wisconsin Power Company, at Madison, Wis., etc.

WRITE FOR DESCRIPTIVE CATALOG, "WP-I"

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BRANCH OFFICES:

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SAN FRANCISCO, Atlas Building.
MEXICO, D. F., Segunda de Dolores 20—14a de Guerrero 3326.
LONDON, ENG., 47 Victoria St., S. W.

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DENVER, HENDRIE & BOLTHOFF MANUFACTURING AND SUPPLY COMPANY.

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TRADE MARK

COAL PUNCHER

Solves the **problem** of applying electricity to machines of the Puncher Type.

One of the fifteen Electric Punchers operated by the Berwind-White Coal Mining Co. at Windber, Pennsylvania.

The Pneumelectric represents the greatest achievement in the building of coal mining machines.

One third power with **equal cutting capacity** of others has made possible a new low record in cost of production.

You need not purchase until thoroughly satisfied.

Results guaranteed

or

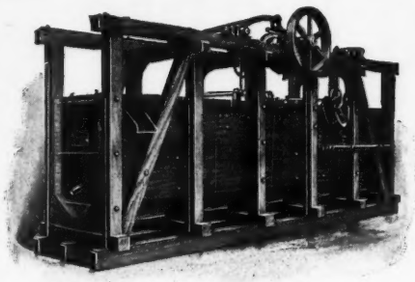
Machines furnished subject to trial.

Write for catalog de luxe.

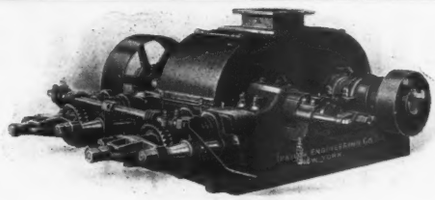
The Pneumelectric Machine Company
TRADE MARK.

SYRACUSE, NEW YORK, U. S. A.

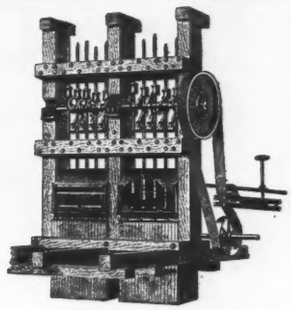
TRAYLOR ENGINEERING CO.



T. E. Co. Quintuplex Jig.



T. E. Co.
High Speed Rolls.



T. E. Co. Stamp Mill.

COMPLETE PLANTS——MACHINERY

The products of the TRAYLOR ENGINEERING COMPANY are constantly improving and our customers have all found it to their advantage to have perfect confidence in our machines—they realize, after one experience, that it adds to their profits to rely upon the best machinery, the best constructed plants, and the ones simplest in operation.

A thorough knowledge of the requirements of our customers enable us to appreciate the fact that a practical man wants the best that he can get for his money—we cater to the practical man.

A man who understands machinery knows that the TRAYLOR MACHINERY is the best constructed machinery on the market, its use convinces him that it is cheaper to operate, he is not bothered with continual breakdowns and the need of repair parts—WHY?

Because we embody in the construction of our products the best material obtainable in the American market.

A trial will convince you—ask us to figure on your requirements. We make a specialty of complete plants, and are able to do the job in the best and most workmanlike manner and in the shortest length of time. The services of our large staff of Consulting, Mechanical and Metallurgical Engineers are at your disposal. DO NOT MAKE A MISTAKE.

CONCENTRATOR, Cat. T-55.

CENTRIPACT SCREENS, Cat. 1-55
POWER, HOISTING & MINING MACHINERY, Cat. F-55
CONCENTRATING MILLS & MACHINERY, Cat. H-55
STAMP MILLING MACHINERY, Cat. I-55
CYANIDING MACHINERY, Cat. K-55
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MANUFACTURERS OF MINING MACHINERY, ALL KINDS, ALL PURPOSES.

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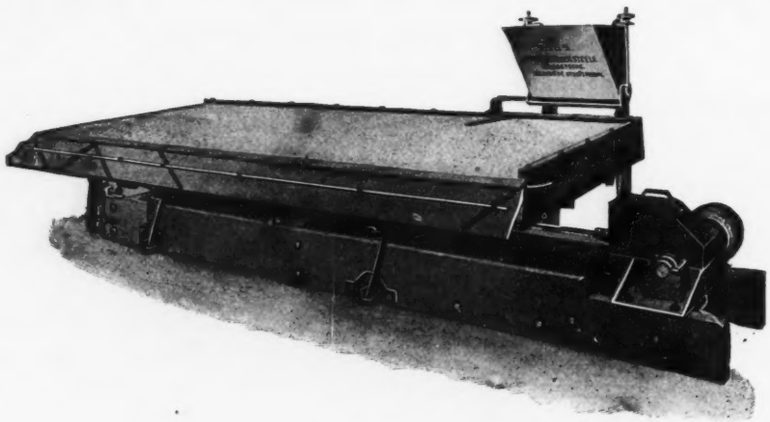
SS&S SS&S SS&S SS&S SS&S SS&S SS&S SS&S SS&S

S. S. & S.

Dry Concentrating Table

WITH NEW BLANK DECK.

The Table That Does The Most Perfect Work.



This table is not only a Dry Concentrator, but also

The Best Table On Earth

Do not attempt to compare it—or its work—with the best types of wet concentrating tables. It has about three times their capacity and makes cleaner concentrates with less loss in the tailings than any of them. There are also numerous other advantages.

Don't take our word for it—investigate. Bulletin for the asking.

Our Specialty

Lead-Iron-Zinc and Lead-Iron-Zinc-Copper Combinations. Do you know of a wet table that will separate these values and make clean tailings? *Write us your concentrating troubles.*

Complete Testing Plant with all S. S. & S. Dry Concentrating and Separating Machinery.

Sutton, Steele & Steele, Inc.,

194 N. Jefferson Street, Dallas, Texas.

No 2

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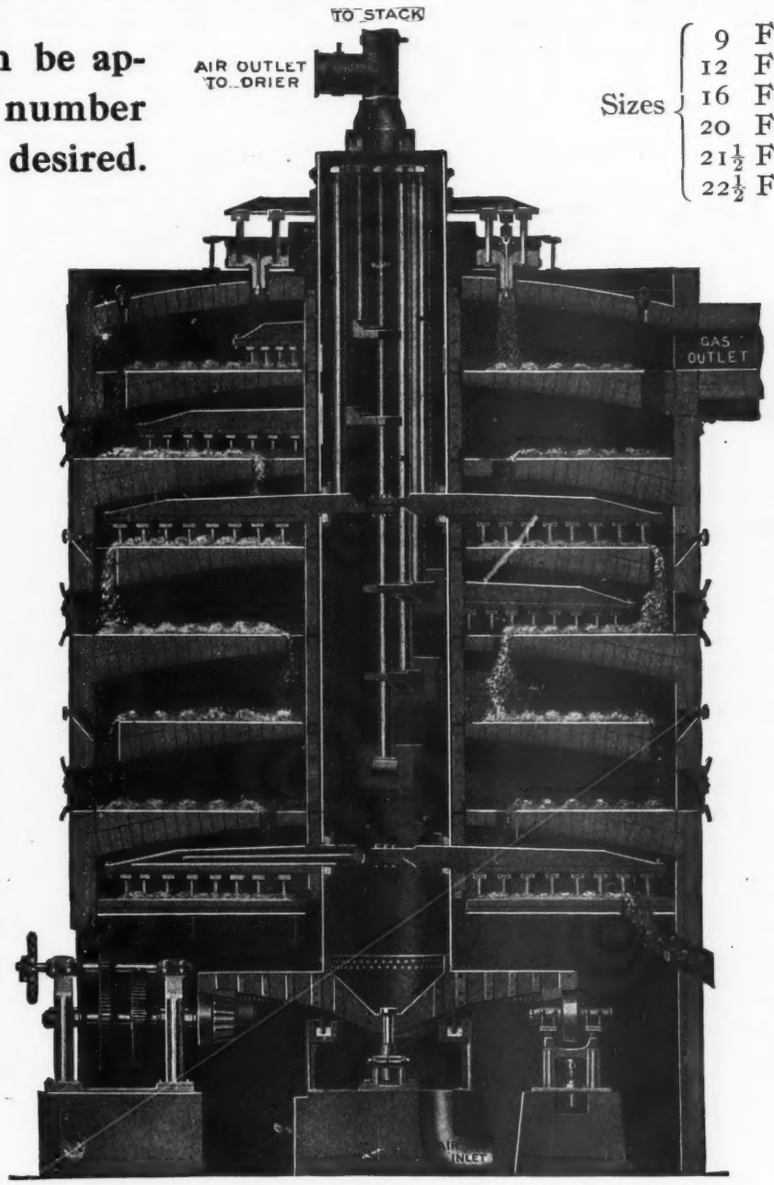
THE WEDGE MECHANICAL FURNACE

Muffle can be applied to any number of hearths desired.



Sizes { 9 Ft., 12 Ft., 16 Ft., 20 Ft., 21½ Ft., 22½ Ft. } Diameter

COOLED WITH AIR OR WATER OR BOTH ACCORDING TO CONDITIONS

CENTRAL VERTICAL SHAFT 4 FEET DIAMETER INSIDE

ALL AIR OR WATER CONNECTIONS INSIDE OF SHAFT WHERE THEY ARE ACCESSIBLE WITHOUT COOLING FURNACE

20-FOOT ROASTER FOR CONCENTRATE OR PYRITES ORE.

Capacity on Concentrate, Western Smelter

Practice . . . . . 85 Tons Per Day.
On Pyrites Ore in connection with Acid Making . . . . 15 Tons Per Day.

SEND FOR CATALOG.

PENNSYLVANIA SALT MANUFACTURING CO.

115 CHESTNUT STREET,
PHILADELPHIA, PENNSYLVANIA, U. S. A.

The Behrend System

Of Dry Concentration Is Ideal and Economical

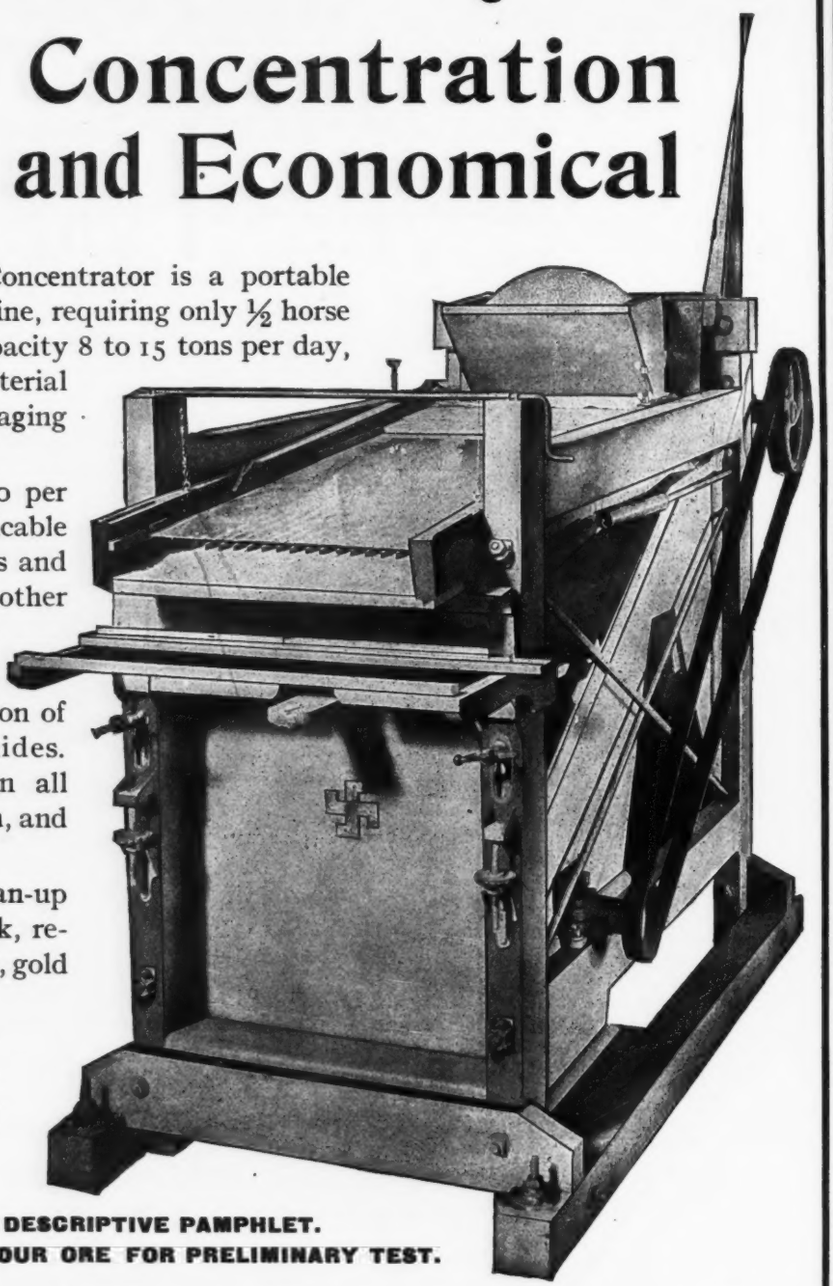
The Behrend Dry Concentrator is a portable and very durable machine, requiring only ½ horse power to operate. Capacity 8 to 15 tons per day, according to sizes of material under treatment, averaging about 12 tons.

Will recover 80 to 90 per cent. of values; is applicable to a wider range of ores and minerals than any other system; requires no skilled labor.

Makes clean separation of zinc and lead sulphides. Works equally well on all sizes from 8 to 100 mesh, and saves the slimes.

Unrivalled as a clean-up machine in placer work, recovering the black sand, gold and platinum.

The usual dust conditions peculiar to dry concentration are entirely eliminated.



WRITE US FOR DESCRIPTIVE PAMPHLET.
FORWARD SAMPLE OF YOUR ORE FOR PRELIMINARY TEST.

The Behrend Dry Concentrator Co.

OFFICE—10 Wall Street, Room 308, NEW YORK.

TEST PLANTS—61 Pearl St., New York. 48½ Inspector St., Montreal, Can.
Henry E. Wood & Co., 1734 Arapahoe St., Denver, Colo.

THE LARGEST MINING MACHINERY HOUSE IN THE WORLD

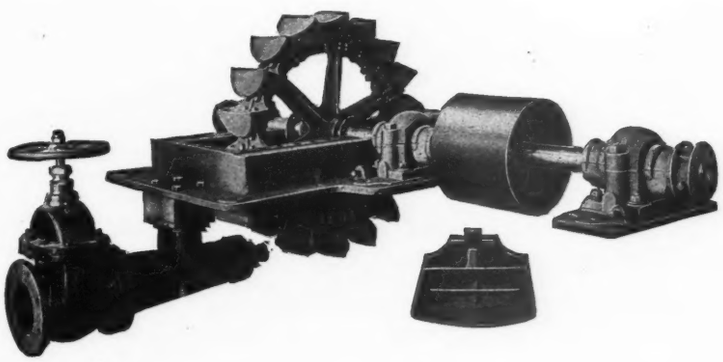
THE MINE & SMELTER SUPPLY CO.

SOLE OWNERS AND MANUFACTURERS OF THE WILFLEY CONCENTRATING AND SLIME TABLE

De Remer Water Wheel

The Horizontal Splitters distinguish the De Remer from all other types of tangential impact water wheels.

We guarantee this wheel to have 15 per cent higher efficiency than any type of turbine water wheel and 10 per cent higher efficiency than any other type of tangential wheel.



In tangential water wheels, the effective dynamic pressure causing rotation is that which is tangential to the circumference of revolution. The arrangement of the Splitters in the De Remer bucket is such that the force of impact of the water is tangent to the circumference of the wheel and a maximum efficiency results. No other wheel is so constructed, hence no other wheel is so efficient.

We Furnish Complete Water Power and Hydro-Electric Equipments

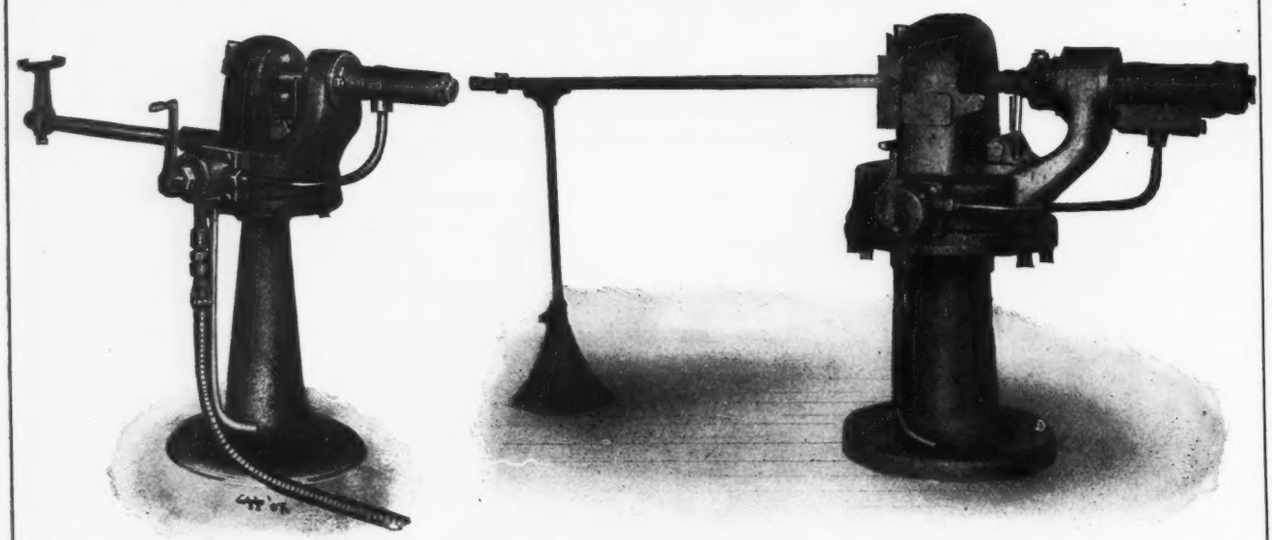
"Send for our De Remer Water Wheel Catalogue."

42 Broadway, New York City ~ Denver ~
El Paso ~ Salt Lake City ~ City Of Mexico

THE LEYNER BULLETIN

June 27 Littleton, Colo., U. S. A. 1908

LEYNER SHARPENING MACHINES.



No. 1 SHARPENER. No. 2 SHARPENER.

No. 1.—Sharpens steel of any cross section and diameter up to and including one inch. Maximum diameter of drill bit, 1⅞".

No. 2.—Sharpens steel of any cross section and diameter up to and including two inch. Maximum diameter of drill bit, 3". (Larger diameters are special.)

For solid or hollow steels. For hammer or piston drills. Any number of cutting points on bits, from one to six. Absolute gauge of bits assured.

Cheaper in first cost. Lighter in weight. Cheaper in freight. Less parts. Less repair cost. Smaller air consumption. Smaller floor space. Simple in construction. Rapid and efficient in operation. One of these sharpeners, with an oil or coke furnace to heat steels fast enough for it, is a combination which no mine operating several drills can afford to be without.

Particulars on request.

The J. Geo. Leyner Engineering Works Company,
General Offices and Works: LITTLETON, COLO., U. S. A.

Manufacturers of Rock Drills, Air Compressors, Drill Sharpeners, Oil and Coke Furnaces, Electric and Steam Hoists, Cars, Cages, Skips, Etc.

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Cleveland
HAMMER DRILLS

REDUCE YOUR COST OF MINING

By using our No. 40 Drill in your stope—
65% less than it costs you to drill by hand
(one of these machines will outdrill 8 to 10 hand drillers.)

50% less than it costs with your piston drills
(Maximum speed, minimum repairs, one operator, no column.)

There are many other reasons for using them, and other advantages to be gained by their use. We will be pleased to give you full information, if you will

WRITE TO THE MINING DEPARTMENT OF

THE CLEVELAND PNEUMATIC TOOL CO.,
CLEVELAND, OHIO, U. S. A.

AGENCIES IN ALL THE PRINCIPAL MINING CENTERS OF THE WORLD.

Drill More Holes Save More Air

What's the use of going into lengthy explanations here, when the above tells you the whole story?

We simply state it as a positive fact, that TRAYLOR AIR HAMMER DRILLS will do more work at a greater saving; easier and better.

Now if you want us to explain WHY, a line from you will bring the necessary convincing data.

John A. Traylor Machinery Company
Denver, Colorado

The "Hole" Story is In The Lugs

THE square shoulders of the lugs pull out the drillings or cuttings *in any kind of a hole.*

That's the main story of Eureka Drill Steel in a nut shell.

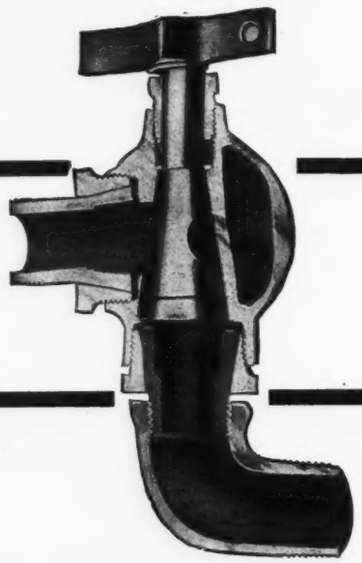
The EFFECTS are shown in a guaranteed saving of 10%, 25%, 30% or 50% in wages paid to machine runners by preventing lost time due to "stuck" drills in back of flat holes. This we positively guarantee.

To convince you, we'll send you a trial bar. If it fails to do all we claim, throw it away and don't pay us. Write for details.

Eureka Drill Steel Company,

1416-1418 Wazee St., Denver, Colo.

Western Lubricating Valves



Your Drills Are Thirsty

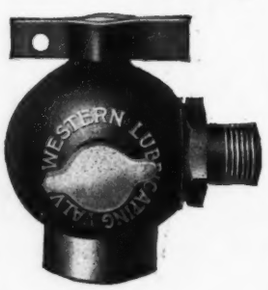
They need oil just as much as your engine, or *any* bearing.

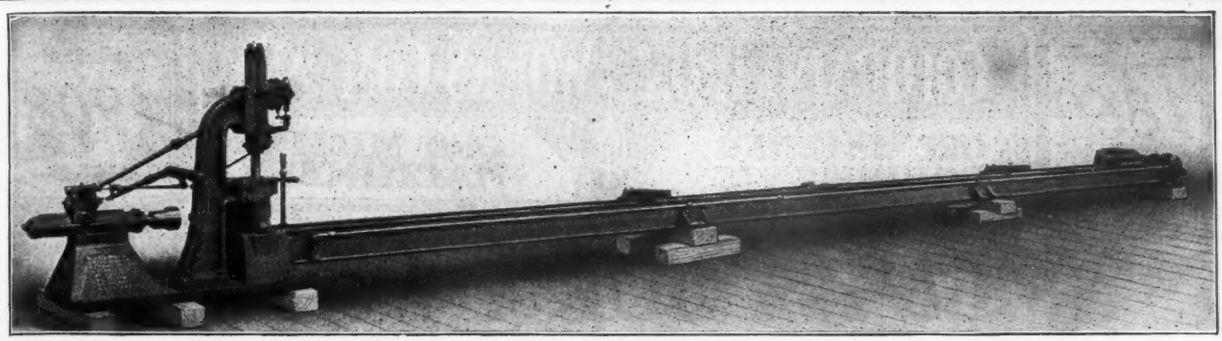
Western Lubricating Valves will keep them constantly lubricated, thereby doubling their length of service and cutting down repairs. 'Tis worth *trying* anyway. $5.00 for the small size; $7.00 for the large, and *money back if not satisfied.* We guarantee 'em to outlast six of the stop-cock type. *They can't leak.* Catalog explains.

The Western Lubricating Valve Co.

1416-1418 Wazee Street

Denver, Colo.





One Man Does the Work

600 Drills in 10 Hours

These machines have demonstrated their usefulness and reliability by being in continuous satisfying service for over four years at mines where other makes of drill sharpeners were either worn out or broken up in less than one year. We have sold more in this country than all other makers combined. *Write.*

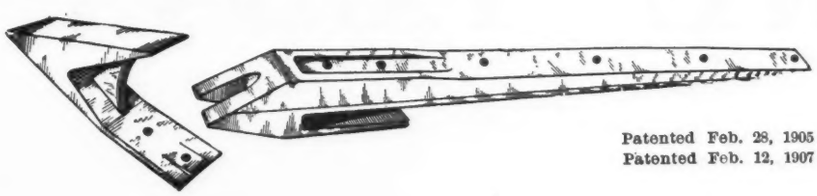
Manufactured in San Francisco, Cal., Houghton, Mich., Rossland, B. C.

WORD BROS., 60 Castro St., San Francisco, Cal.

The Panama Tooth

"Taylor Made" From

Manganese Steel



Patented Feb. 28, 1905
Patented Feb. 12, 1907

This Two-Part Dipper Tooth with its Manganese Steel Point will last from 3 to 5 times as long as the best forged steel type. The point is always sharp and can be changed in a few minutes.

SEND FOR CATALOG

Taylor Iron & Steel Company

Sole Manufacturers **High Bridge, New Jersey**

1860

COLORADO IRON WORKS COMPANY

ORE SMELTING EQUIPMENTS

ORE MILLING MACHINERY

1908

SMELT YOUR OWN ORE

Many ores for which direct smelting would be the most suitable are now treated by other processes. Other smelting ores are shipped to custom smelters at a heavy expense for transportation and treatment. A very large number of ores, too low in value for shipment to a smelter, could be smelted on the ground at a good profit.

For a large class of sulphide ores, direct smelting is the process which is least expensive and which at the same time makes the highest recovery.

If you can make an output which would justify the building of a mill of reasonable size, you could erect a smelter which, if your ore is suitable, would assure you the greatest possible net return for your product; for smelting has been reduced to a science and rests on a surer basis than other processes. Contrary to the general impression, smelting is a simple process.

It would pay you to investigate this subject. We will tell you whether or not your ore can advantageously be smelted, what the recovery should be and what the operating costs.

COLORADO IRON WORKS CO.,

Office and Works 33rd and Wynkoop Sts., DENVER, COLO,, U. S. A.

There's A Big Difference

between ore testing with undersized machinery and

ORE TESTING

with a plant of full working capacity. Yet it costs you no more to have us test for you in our plant which is the biggest and best equipped in the country. We have no machinery to sell or recommend but we determine exactly the size mill you need and the best and cheapest method of extracting values. Write.

We are Metallurgists and Mining Engineers

CALIFORNIA ORE TESTING CO.,

ABBOT A. HANKS F. L. BOSQUI JOHN H. HOPPS

425 WASHINGTON ST., - SAN FRANCISCO, CAL.

WOODBURY SLIME CLASSIFIER

Here is our latest type 48″ slime classifying jig, capacity 500 tons, per 24 hours, such as we are installing in many Montana mills on Butte sulphides. In looking for means of reducing your milling costs, and of simplifying your process, have you considered the possibilities of this machine? If not, listen—

You can treat your ores *unsized*, meaning practically the elimination of trommels and screens.

You can eliminate hydraulic classifiers and settling tanks, for as a slime classifier, it separates all slime, without dilution.

You can improve your jigging, for as a jig, it increases recoveries, and improves the grade of concentrates.

You can reduce water, labor, power, and floor space.

You can lower your tailing losses.

Write for Bulletin.

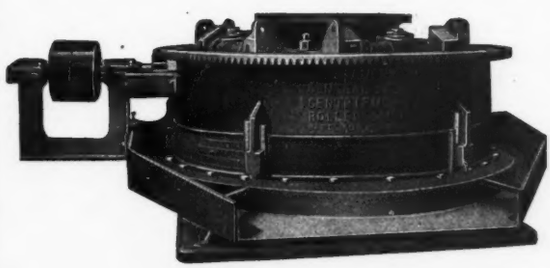
NATIONAL ORE CONCENTRATION CO.,

1730 First National Bank Building, **CHICAGO.**

ESTABLISHED 1855

FULTON IRON WORKS

SAN FRANCISCO, CAL.



The Graupner Patent Central Feed Centrifugal Roller Quartz Mill. A great improvement on all other Centrifugal Mills. No wood wedges used. No wood frame required. Even wear on ring die. Entire inside working parts removed at one operation. Send for illustrated catalog.

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Is one of the lines of engineering which we have been specializing for a number of years—This view was taken during the construction of a 100 stamp mill and cyanide plant which we constructed, equipped, operated and handed over in running condition to the Tonapah Mining Co. The record of this mill has shown it to be one of the most **thoroughly first-class** plants of the kind in the West.

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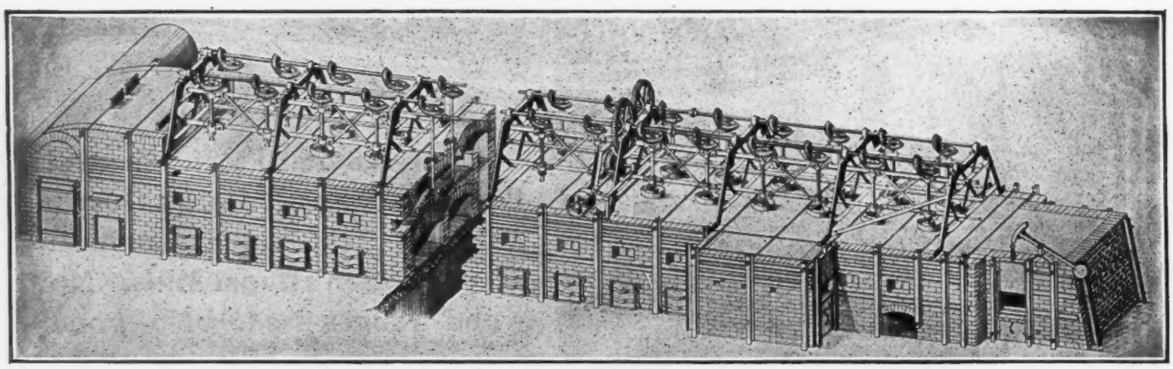
Tilting, Simplex and Duplex types—for all kinds of Ore Roasting.



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These furnaces are roasting successfully today ores containing Gold, Silver, Copper, Zinc, Cobalt Lead, Arsenic, etc., for after treatment by

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THEY ARE NOT DUST PRODUCERS

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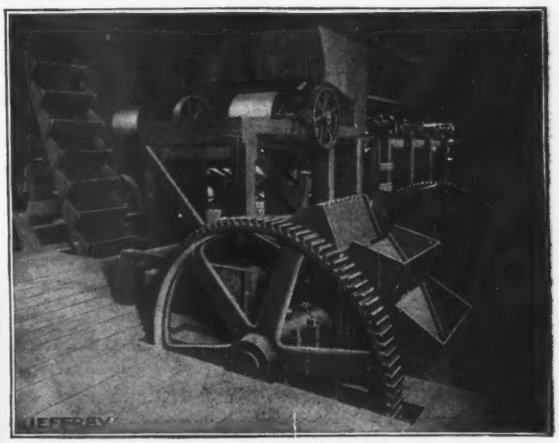

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SMALL POWER REQUIRED
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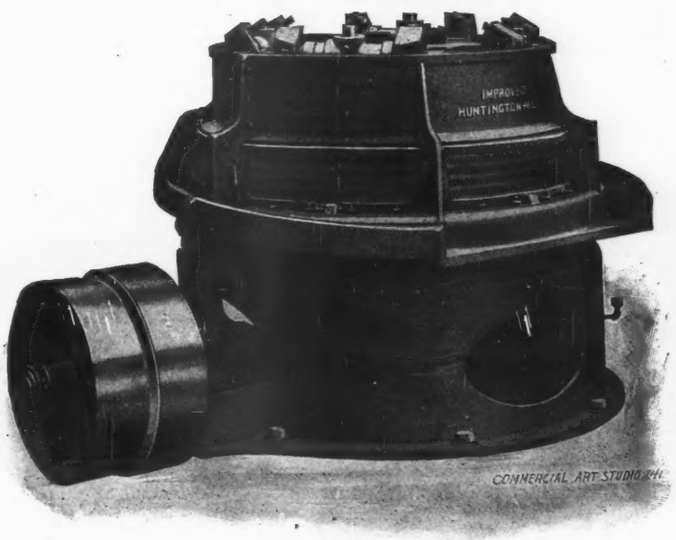

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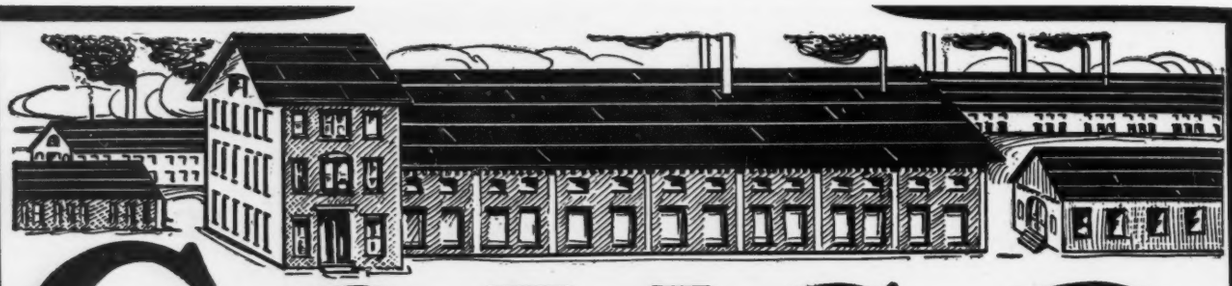

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Congo Roofing has stood this test, and has proven its worth as a protection against all kinds of climate and weather.

Many buildings the country over are covered with Congo, which have already given many years of service, and are good for many years more.

Heat and cold, rain and snow, have no appreciable effect upon Congo. Even fire itself is stubbornly resisted by these roofs. Not the least attractive feature of Congo is the price. It is the cheapest of the high-grade rubber roofings.

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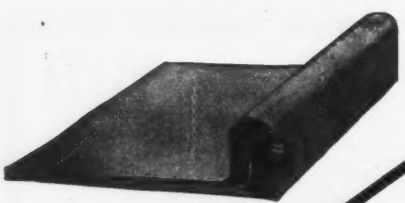

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and REVERE CONCENTRATOR BELTS outlast the best of others.

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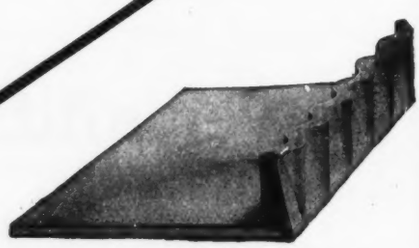

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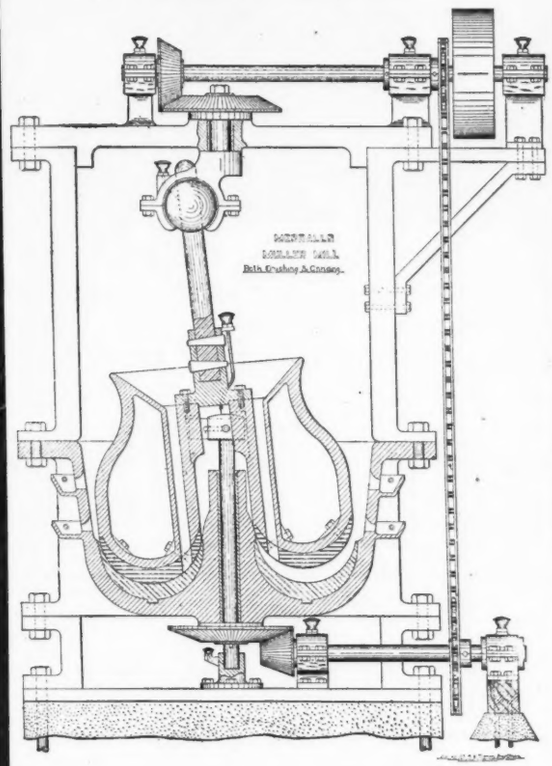

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is the most economical machine ever built for wet grinding from 20 to 200 mesh.

It requires no screen and the ground pulp is lifted to the discharge outlets by the force of the water.

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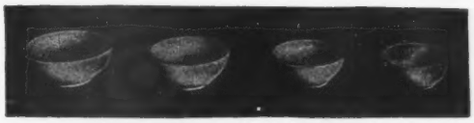
are imitated—imitated in appearance only—not in quality.



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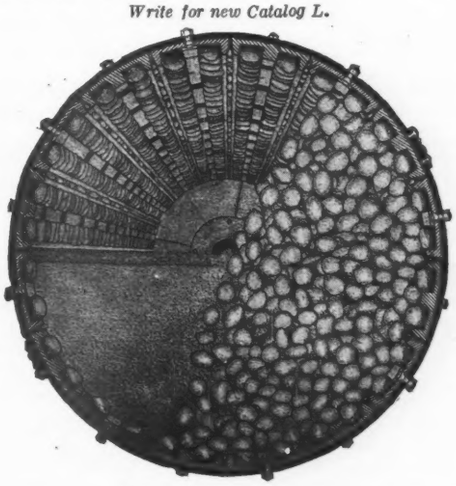

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The El Oro tube mill lining lasts three times as long as the ordinary smooth white iron or silex.

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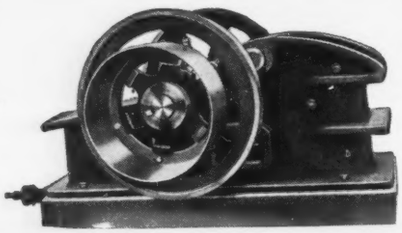
ALL-STEEL ORE CRUSHER
Simplest, Strongest and Most Durable Machine Made.



The frame is a solid steel casting made in one piece.
The pitman and swing jaw are made of solid open hearth steel castings.
The crusher can be adjusted to crush fine or coarse.
It is free from light and trappy connections.
The head room required is low, making it convenient to feed and especially desirable for mining purposes.
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Crushing Rolls: 18″x12″ to 60″x60″. *Send for Catalog.*

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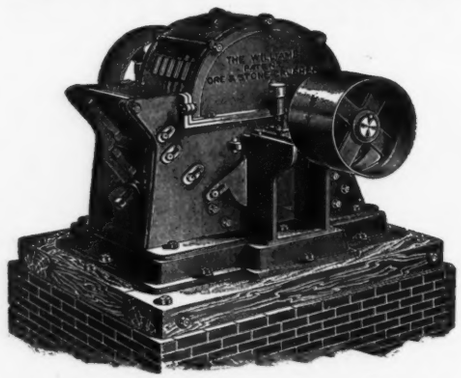
CRUSHERS
FOR
COKE OVEN WORK AND ANTHRACITE DEBRIS



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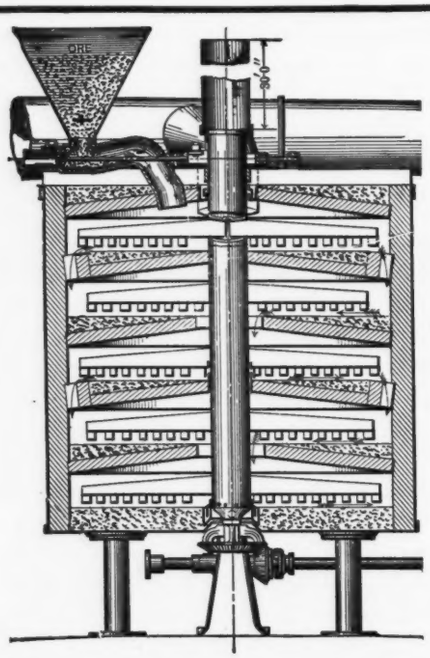

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The Herreshoff Roasting Furnace
For Desulphurizing Ores
For Particulars see Page 237, Mineral Industry, Vol. VI, or apply to Manufacturers.

We have recently been calling your attention to our
ORE WASHER
OUR
ORE JIG
is equally as important. Used to separate the waste from ore too small to hand pick 1″ and under.
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McLanahan-Stone Mach. Co.
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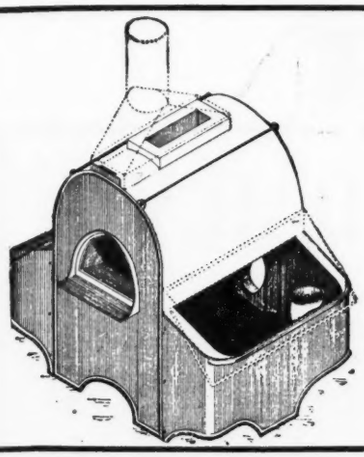

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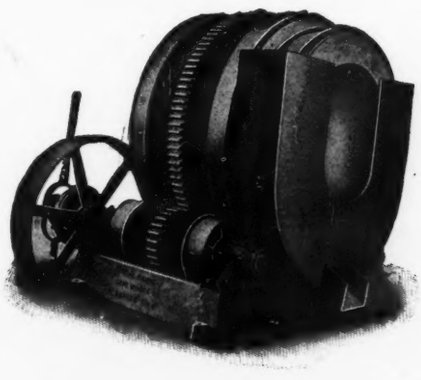

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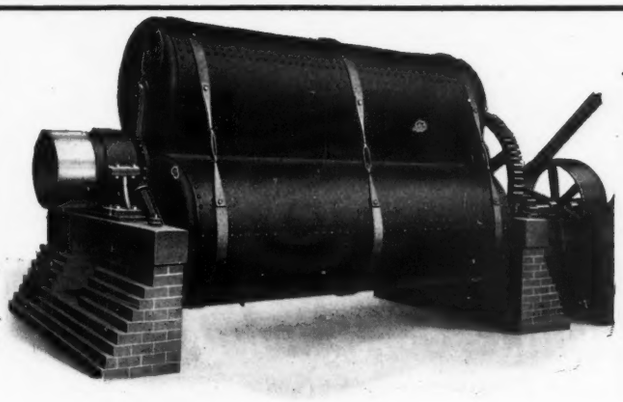

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SAVES 50% IN POWER.
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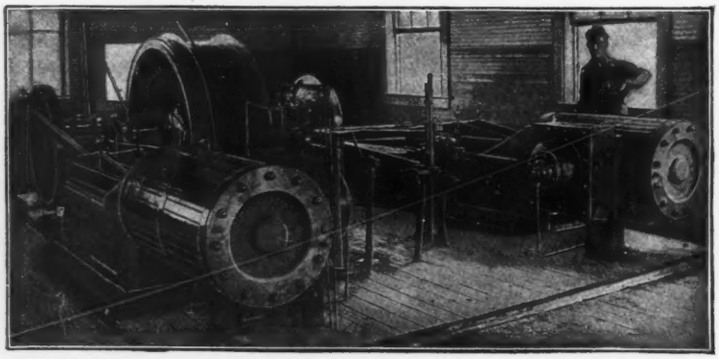

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3477 TONS OF COAL IN ONE 8 HOUR DAY

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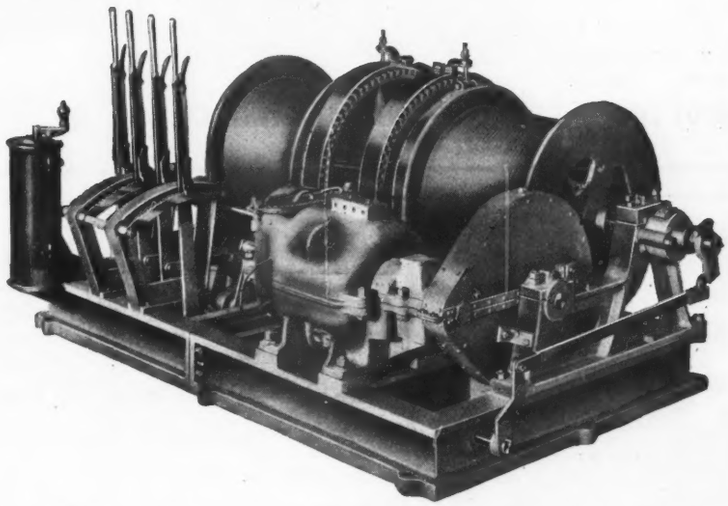

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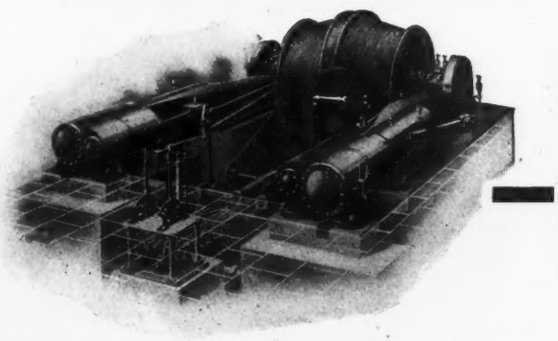

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with conical drums, steam reverse, steam brake and Nicholson engine stop which prevents over-winding. WRITE.

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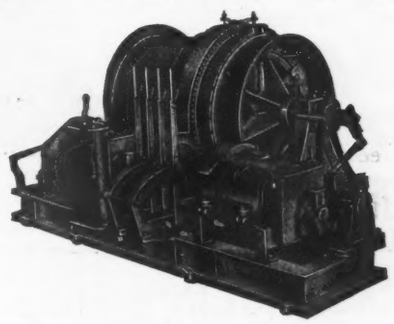
General Electric Company

Motor Hoists

for every kind of outdoor or indoor hoisting service.



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Hoists equipped with 550, 440 or 220 volt motors for alternating current or 500, 250 or 220 volt motors for direct current. 1535

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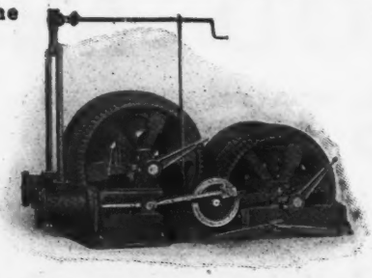
This machine is strong, durable and always reliable. Especially suited to underground work. Write.



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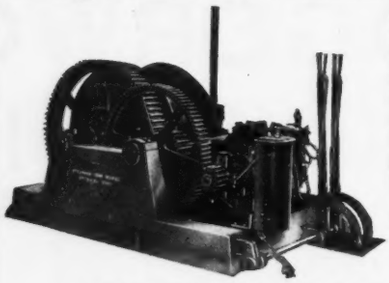

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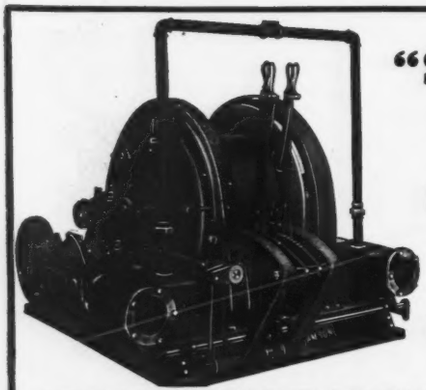

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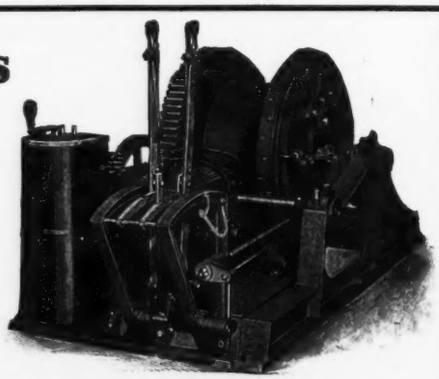
Steam and Electric.

Samson Hoists of all types are high grade machines.

Bulletins upon application.



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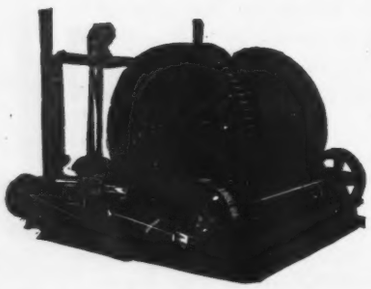

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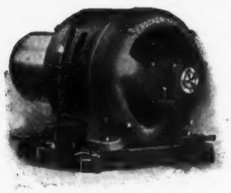

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Westinghouse Motor Driving Aldrich Quintuplex Pump.
Designed to deliver 425 gallons per minute against 1100 feet.

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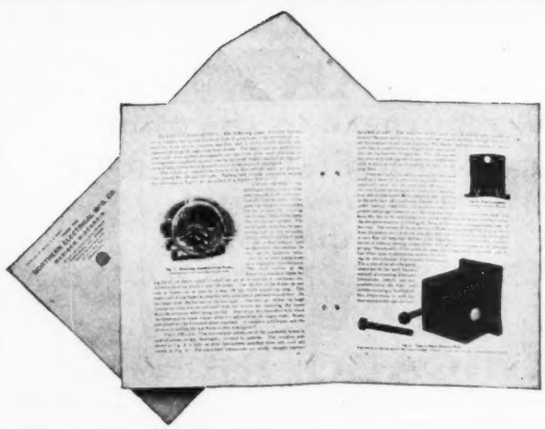

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Strong and sturdy as an oak. Designed for standing up under the hardest service. As durable as high grade material and fine workmanship can make them.

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Represent the product of 20 years' experience and detail improvement.

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We are trying a new policy in our advertising; seeing if a small space will not bring in the same volume of inquiries. If so, you save the difference. But don't judge either our ability or our capacity by the size of the space.

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The Youngstown Car Manufacturing Company
Youngstown, Ohio

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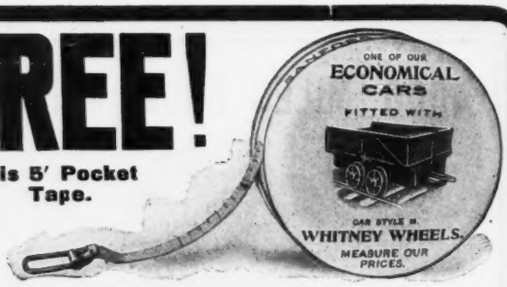

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Successors to A. WHITNEY & SONS, Phila. Est. 1847.

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MANUFACTURED BY

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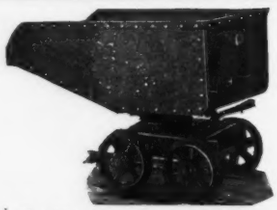
Costs less than one cent a ton to deliver coal or ore from the mine track to the tipple or dump



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Complete Equipment for

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Switches, Turntables. Light Rails Carried in Stock.

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For every purpose in the Mine type

STANDARD MINE CARS
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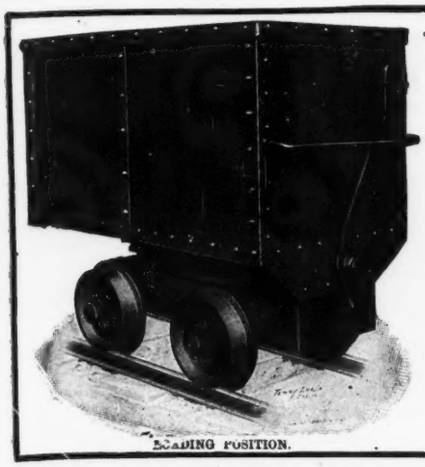

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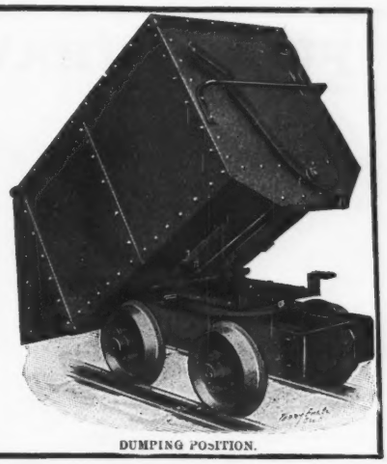
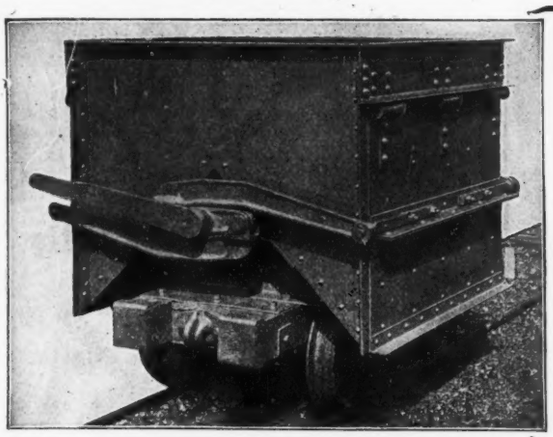
We illustrate our Standard Type of Mine Car. Made in capacities from 12 to 80 cu. ft.

We build cars of special design for any conditions of service. Send us your specifications, our prices will interest you.

Our No. 86 Steel Car Catalog furnished on application.



DUMPING POSITION.



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Made to stand hard service. All styles for all purposes.

Rails—Switches—Turntables

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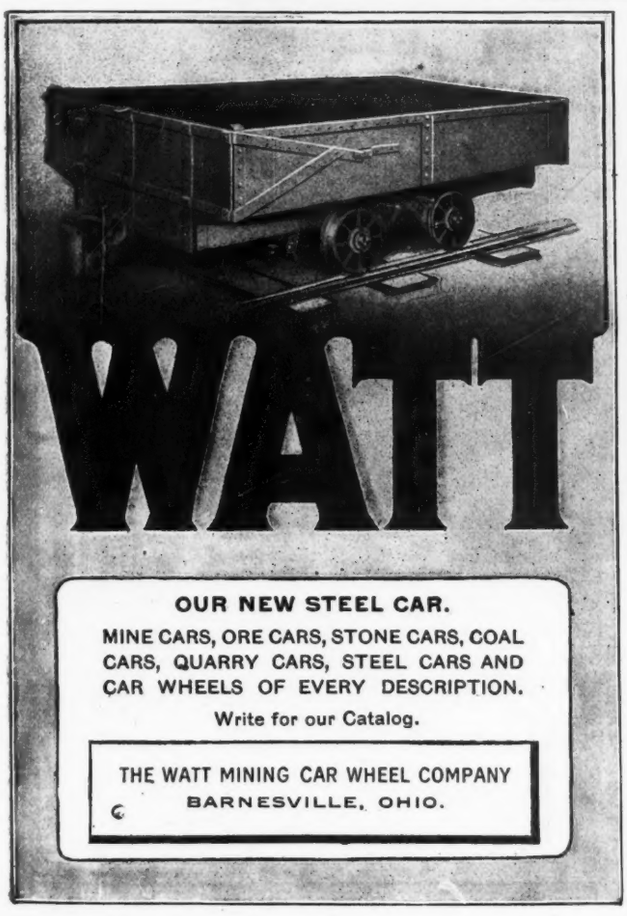

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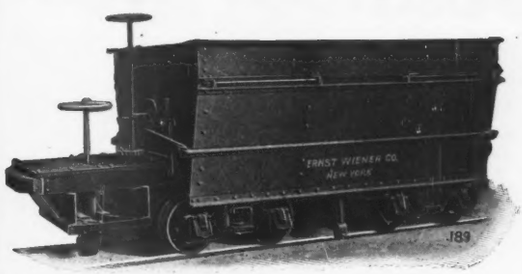

The above shows one of our many styles of ore cars. It has a gable bottom, cable grip and automatic door unlocking device. We build these cars for any capacity and gauge of track.

Our manufacturing facilities in this line are unlimited as our factory is equipped with special machinery and our mechanics are experts.

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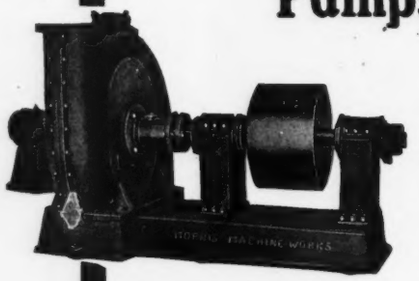

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They require but half as much power as any centrifugal pump delivering the same quantity of water.

No danger from grit, mud or acid in the water. Catalog ?

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Established 1864
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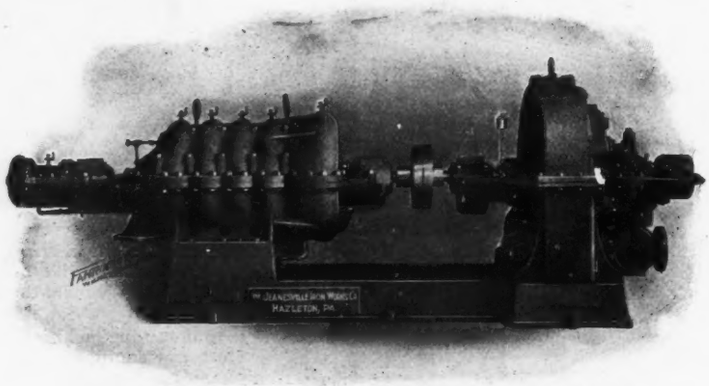
Jeanesville Turbine Pumps



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Direct-connected to 300 H. P. Terry Steam Turbine.

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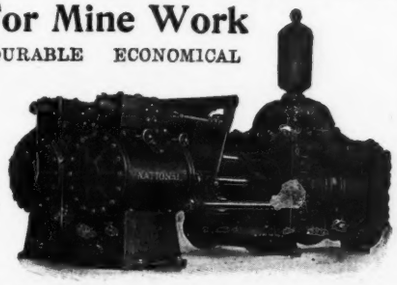
CONVENIENT DURABLE ECONOMICAL

Can be furnished in either Simplex or Duplex styles with Simple or Compound Steam Cylinders.



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SPLIT CASE

every part easily accessible by removal of the upper half of its split case.

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Aldrich Electric Pumps
Vertical Quintuplex Type.

The vertical standard consists of two hollow box frames fortified by a parabolic brace. Ledges are cast on side of frame which carry the weight of working barrels and effect perfect alignment. Underneath the standards is placed a massive base which ties the motor and pump together in one compact and self-contained machine. Pump is sectional and can be placed in small mine shafts when desired. 8 sizes, capacities from 35 to 400 gallons per minute and total working lift of from 500 to 1400 feet. Valuable Pump Data sent free.

THE ALLENTOWN ROLLING MILLS,
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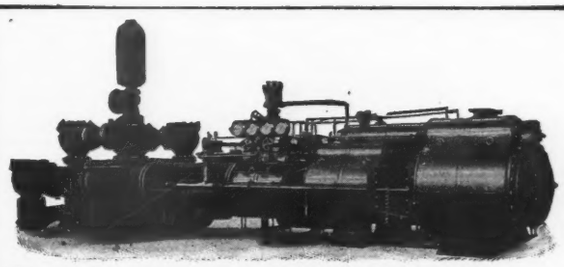

Triple Expansion Mine Pump
for deep mine work where fuel economy is essential.
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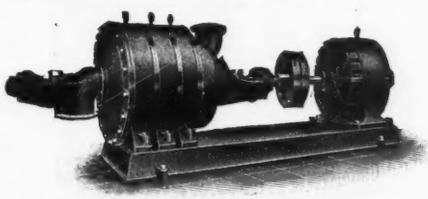
FOR HIGH LIFTS

Fitted with Automatic Balancing Device—No Thrust or Roller Bearings Used—All Sizes.



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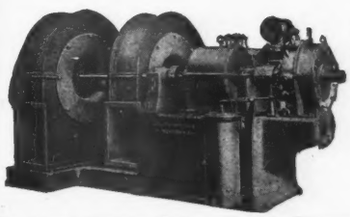

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Adapted for Any Power

Fig. 61.

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Pulsometer Steam Pump.

Requires no engine, belt, oil, packing or special foundation; merely a steam pipe from boiler—that's all.

Operates as well suspended as stationary.

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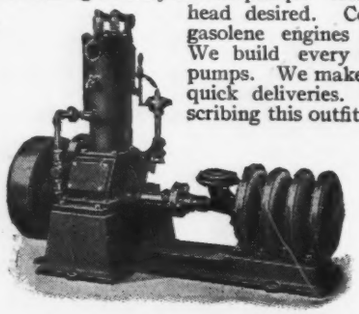

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The best pumps on the market for disposing of large quantities of mud, gravel, quicksand, etc. *Non-chokable.* Catalog of supplies?

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The most durable pump for elevating TAILINGS, SLIMES, BATTERY SANDS, ETC.
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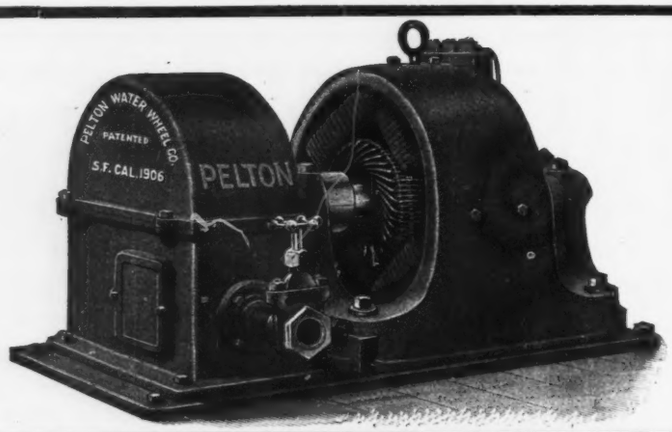

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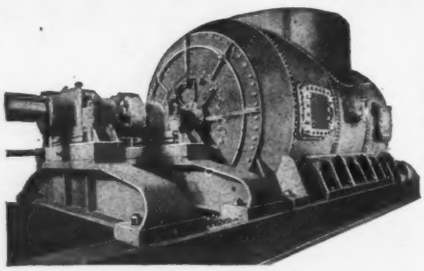

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BUILT BY
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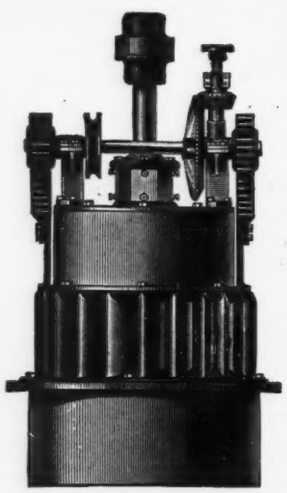

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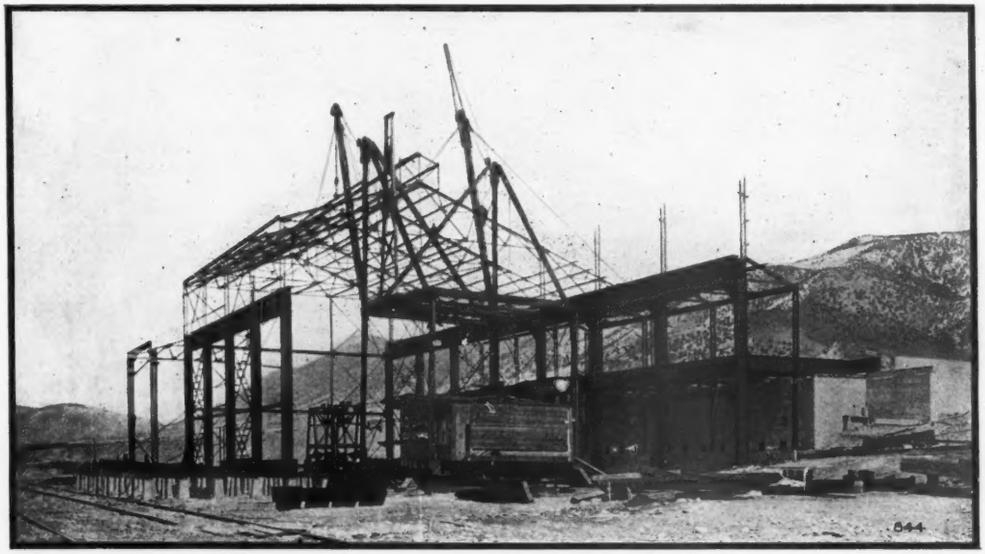

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"At the present price of copper the new table installation in our one mill alone gives us $150,000 additional yearly profit."

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A perfect Ore Crusher for Fine work.

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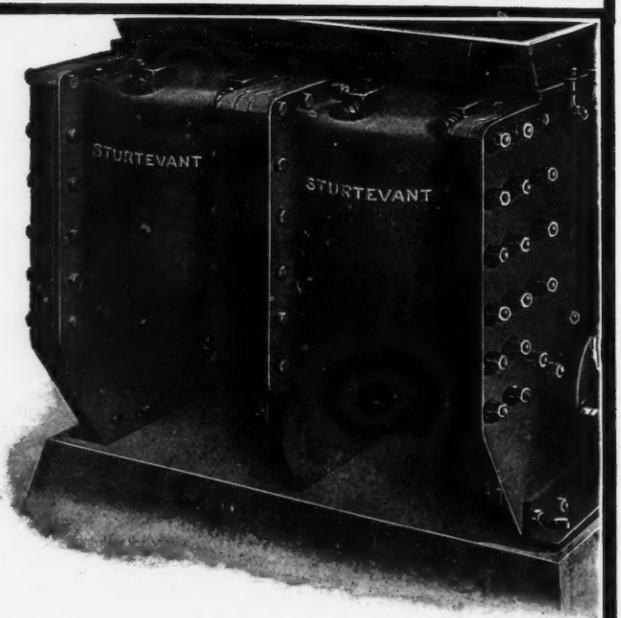

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Wire and Sheet, Crucibles and Dishes. Platinum in all forms for all purposes. Scrap purchased.
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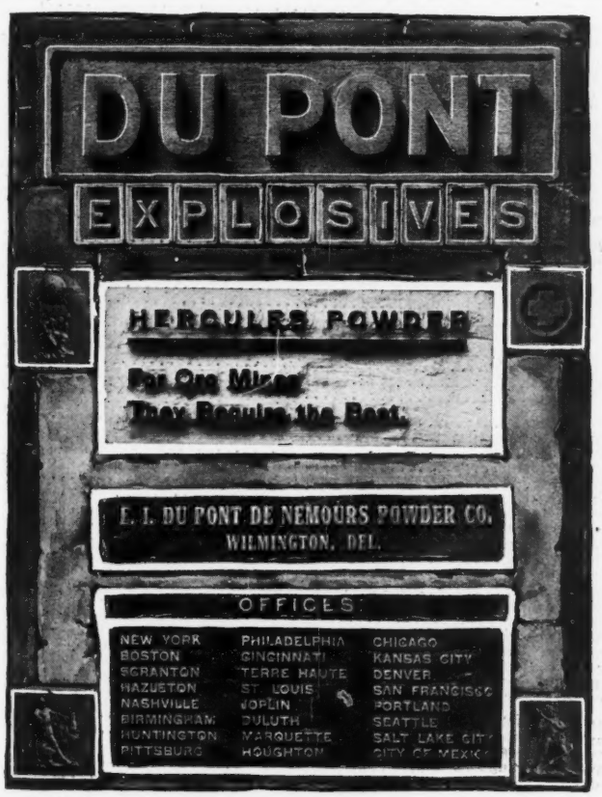

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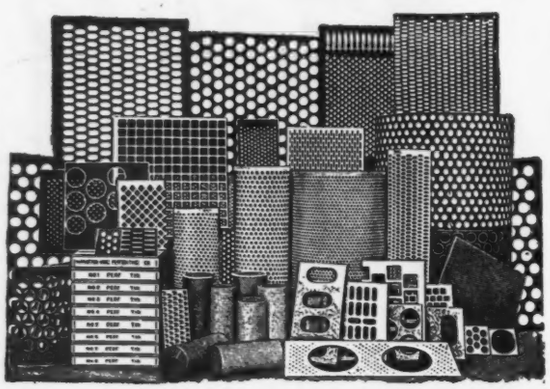

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Shultz Sable Rawhide Belting

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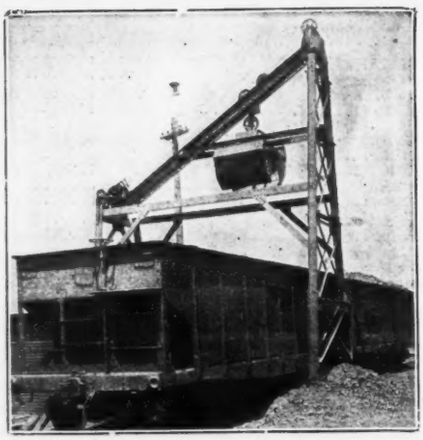

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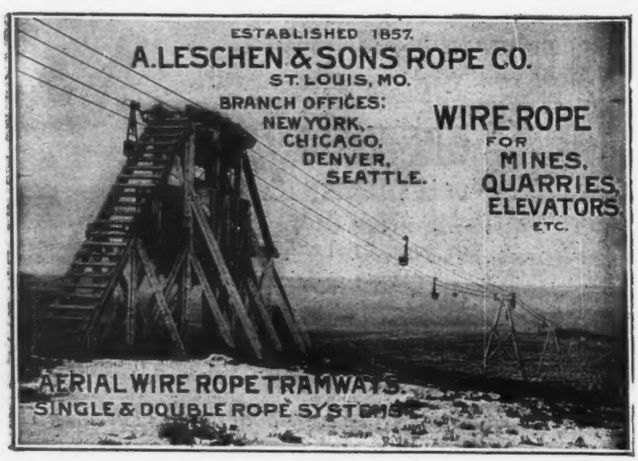
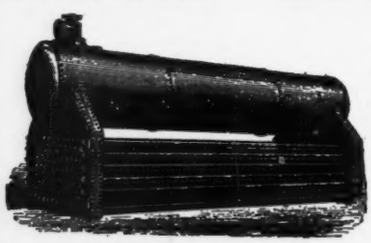


HEINE BOILERS



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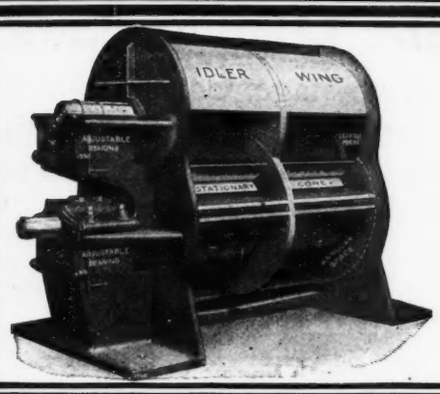

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TRADE MARK

BLOWERS

Especially adapted for mine ventilation

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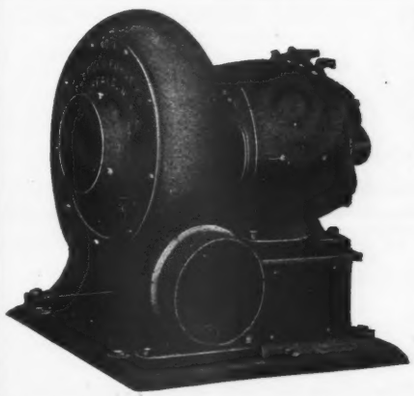

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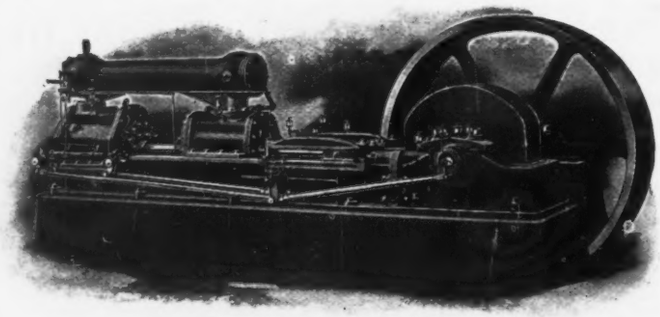

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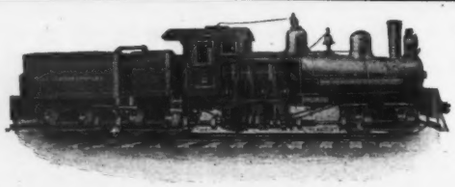

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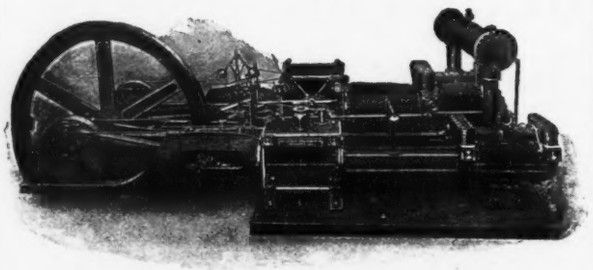
AIR COMPRESSORS.



THE cut above shows one of our Class XE2 Cross-Compound Two-Stage Cincinnati Compressors with Corliss Steam-Valve Gear. Size 20 & 36x30 & 18x36 recently installed for the Bureau of Construction and Repairs at the Norfolk Navy Yard. Send for Bulletin L 516.

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All Classes **LIGHT LOCOMOTIVES** Any Gage

With every locomotive goes our absolute guarantee covering everything for which a builder can be considered accountable. TELL US YOUR NEED AND ASK FOR PRICES.

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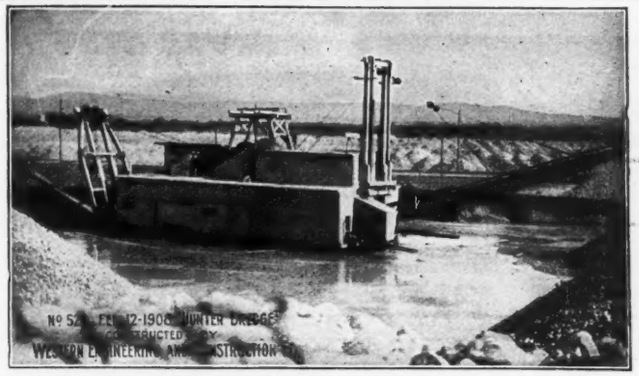

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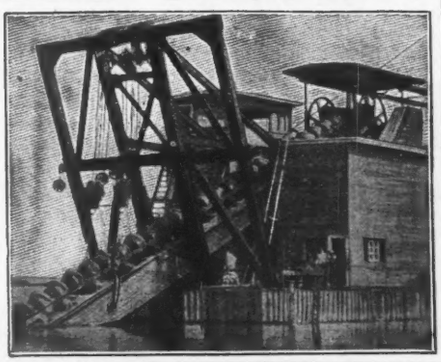

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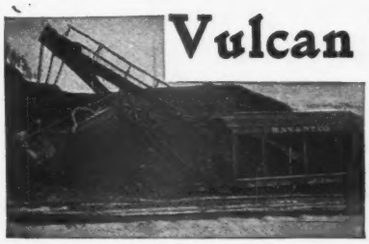

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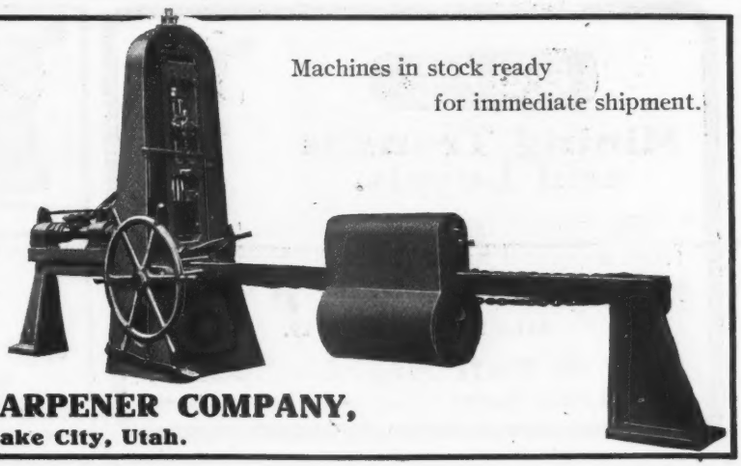
Machines in stock ready for immediate shipment.



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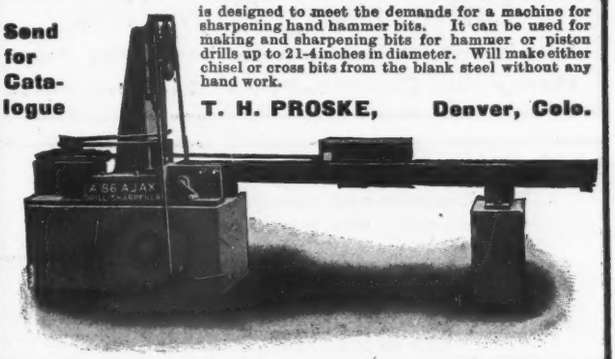

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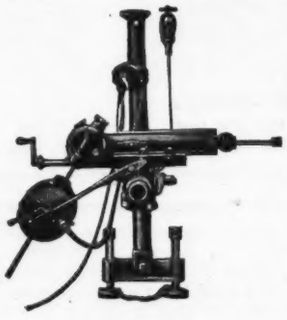

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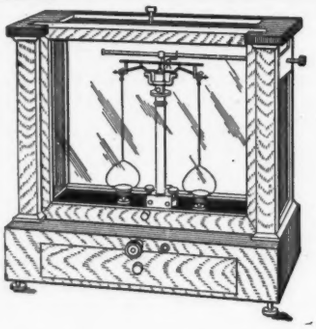

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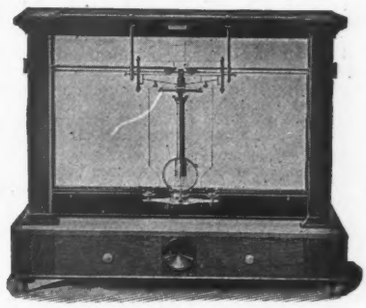

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Button Balance
Sensibility 1-200 Mg.

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It has all the latest improvements, including unit base, improved rider apparatus and star wheel adjustment.

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There is nothing more aggravating than a poorly working rider carrier and to overcome this we have adopted the

Improved Rider Carrier

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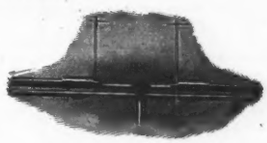

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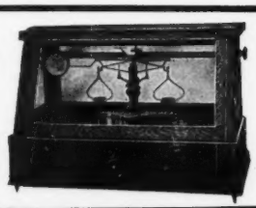

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Assay Balance
call it. When they need a new one, they will always REPEAT their order for another
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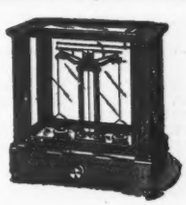

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A mining and mechanical engineer, at present engaged in private practice, would like permanent position, preferably with some company in the development stage or just preparing to install mill or extraction plant. I have had, in addition to technical training, about twelve years' experience, which includes a thorough training in all the practical work encountered in mining operations, and am especially familiar with modern cyanide practice and pyritic smelting. If the work is in the early development stage, would accept moderate salary during this stage of the work. References from clients and former employers. Address B. F. Hoffman, 214 Maryland St., Buffalo, N. Y June 27.

Assayer and chemist; technical graduate; certified in British Columbia by examination. Familiar with amalgamation, cyaniding and general mill operations. Single, reliable, experienced. Open for engagement. Address Box 395, ENGINEERING AND MINING JOURNAL. June 27.

Cyanide man (27), thoroughly experienced, technical graduate, operating over five years in the United States and Mexico, desires to take charge of a cyanide plant. At present metallurgist for one of the largest cyanide plants in the West; desires to make a change. Spanish spoken. Address "Capable," ENGINEERING AND MINING JOURNAL. No. 398, July 18.

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Chemical engineer, thorough experience, electrical, chemical, mechanical; design, erection and superintendence, desires change; at present superintendent, chemical works; age 36, married; graduate in chemistry; sixteen years' experience. "Chemical Engineer," care ENGINEERING AND MINING JOURNAL. No. 393, July 25.

Engineer just from Chihuahua with experience in charge of mines in Sonora and Guerrero is open for engagement. Special experience with animal transport and erection of plant. Ready to leave New York at once. Examinations and consulting work accepted. Speaks Spanish and have success in handling Spanish-American labor. J. W. Miller, 30 West 44th Street, New York. July 4.

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Graduate chemist and assayer, recently with a custom lead smelter, desires a similar position in mine, mill or smelter, or would accept any kind of a position in a cyanide plant, where technical training is a desideratum. Permanent position only. Will go anywhere. First-class references. Address "Exceptional," ENGINEERING AND MINING JOURNAL. No. 394, July 18.

Manager open for engagement. Twenty years' practical experience mines, smelters, and other reduction plants. United States, Australia, Central America, Mexico. English, German and Spanish fluently spoken. Technical graduate. References exchanged. Specialty: economic methods of mining and reduction of ores. Address "Fulano," ENGINEERING AND MINING JOURNAL. No. 390, July 11.

Mining engineer, Columbia graduate, 27, married, possessing unusually thorough experience in gold, silver, and copper mining, in Colorado, Montana, Idaho and Nevada; has held down everything from mucker to foreman; open for engagement as foreman or superintendent. Address "Integrity" care ENGINEERING AND MINING JOURNAL. No. 388, June 27.

Mining engineer, at present general manager of one of the largest copper concentrating and smelting properties in Canada, desires change of position for personal reasons, would like to get in touch with mine owners with copper properties in need of development or careful business management. "Copper," care ENGINEERING AND MINING JOURNAL. No. 349, June 27.

Mining and metallurgical engineer desires position. Technical graduate, twelve years' varied experience, assayer, chemist, surveyor, mine oreman, cyaniding, to superintendent managing properties. Cyaniding, milling, lead smelting. Nine years' experience in Mexico, thoroughly familiar with conditions and labor; three years' experience in United States. Speaks German and Spanish. Can leave present position on short notice. Address "G. B. T.," ENGINEERING AND MINING JOURNAL. No. 381, July 4.

Mine superintendent desires position with responsible company. Excellent references extending over twenty years. Milling and mining gold and silver ores especially. Address "Engineer," P. O. Box 160, Mad. Sq., New York. June 27.

Mining engineer and geologist. Fifteen years' experience with largest companies operating in United States and Mexico in managerial capacity. Specialties gold, silver, copper and lead, with broad experience in milling, concentrating, cyaniding and smelting. Technical graduate. Fluent Spanish. Open to immediate engagement. Best bank, commercial and technical references. Address "Crisis," care ENGINEERING AND MINING JOURNAL. No. 383, July 4.

Mining engineer, with fifteen years' experience as manager or superintendent of mines and mills in the United States, Mexico, Central and South America wants position as manager or superintendent. Thoroughly understands economic mining and milling; is an assayer, millman, surveyor and bookkeeper. References unexcelled. Address "J," ENGINEERING AND MINING JOURNAL. No. 399, July 18.

Mining engineer wishes position with good coal company. Competent to assume full charge of large operations, whether new or old, coal or coke. Eight years' experience, principally in southwest Pennsylvania. Modern operations a specialty. Graduate E. M. Good record in past. Write "Coal E. M.," care ENGINEERING AND MINING JOURNAL. No. 397, June 27.

Metallurgist, single, technical education; at present with large custom smelter, wishes position as superintendent, or as assistant to general manager; extensive practical experience among the principal copper and lead smelters of this country; also conversant with current practice in the milling of ores of precious metals; satisfactory reference as to ability and integrity. French and Spanish spoken. Address "H. R. B.," ENGINEERING AND MINING JOURNAL. No. 367, August 8.

Master mechanic, twenty-two years' experience with mining and smelter plants. At present employed with large copper company; wishes to change location. Copper smelters a specialty. References furnished upon request, including present employers. "R. A. W.," ENGINEERING AND MINING JOURNAL. No. 392, July 4.

Mine superintendent with practical experience as superintendent, foreman, engineer and assayer, accustomed to keep mine accounts and capable of taking charge of property seeks position in Mexico; five years' Mexican experience; speaks Spanish and understands handling Mexican labor. Apartado 484, Mexico, D. F. No. 387, July 25.

Professorship or instructorship in mining school is desired by mining engineer, graduate of college and mining school, with experience in different fields East and West, now employed with large coal company. Address "E. M.," ENGINEERING AND MINING JOURNAL. No. 391, July 11.

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Superintendent, age 30, unmarried, graduated Cambourne Mining School, 1907: first-class certificate. Served two and one-half years' apprenticeship in engineering works, Glasgow. Experience mainly confined to gold mining and metallurgy in California, Western Australia and Rhodesia. Have worked for large and well known engineering firms as surveyor, cyanide manager and superintendent, and have had unusual opportunity for experience in estimating ore reserves. Address Alfred B. Willis, care R. Willis, Board of Trade Building, Montreal. No. 386, TF.

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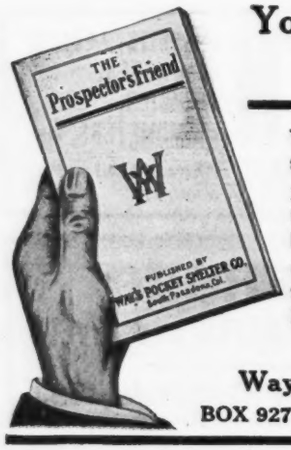
Wanted—Position as master mechanic or assistant master mechanic, experienced in smelting and mining work; understanding electrical machinery and transmission of power; United States, Canada or Mexico. Address "S. W.," care ENGINEERING AND MINING JOURNAL. No. 385, June 27.



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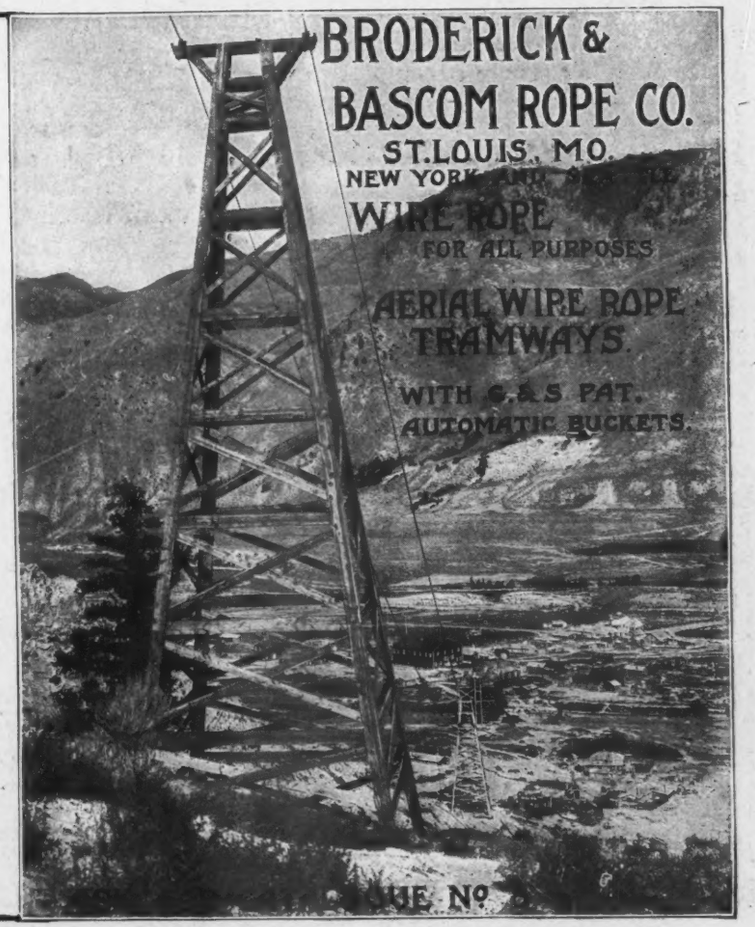

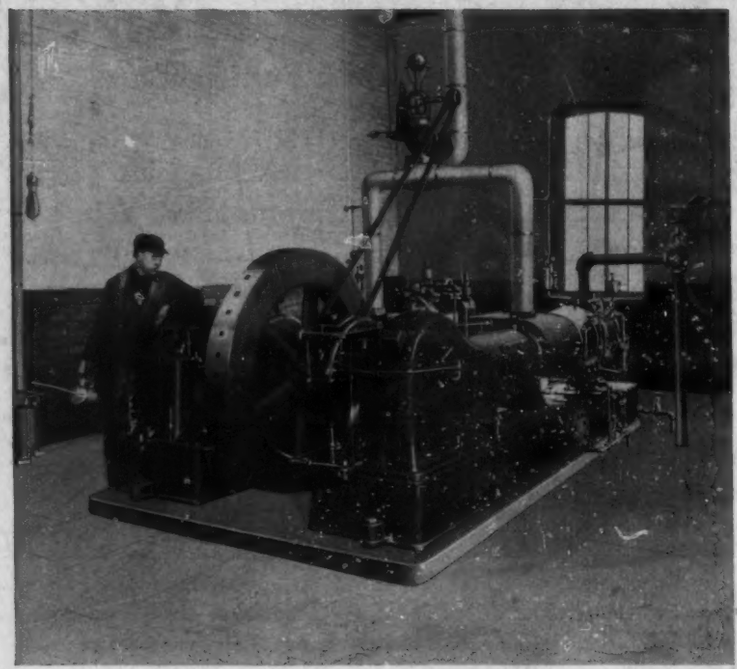

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